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THE CONSTITUTIVE PROCESSES OF MEMORY IN ORGANIZATIONAL COMMUNICATION

The Ohio State University Ph.D. 1979

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THE CONSTITUTIVE PROCESSES OF MEMORY
IN ORGANIZATIONAL COMMUNICATION

DISSERTATION
Presented in Partial Fullfillment of the Requirements for
the Degree Doctor of Philosophy in the Graduate
School of The Ohio State University

By
Richard M. Olson, B. A., M. A.

* * * * *

The Ohio State University
1979

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The experience of writing a dissertation reinforces the value of human support. The writer needs the help of others and I was helped by many people. Professors William Brown and James Golden provided a positive atmosphere that made it possible for me to return to the dissertation. Professor Thomas McCain was willing to risk support of my ideas and I am indebted to him. Professor Joseph Pilotta gave his time and advice when it was most needed. He gave guidance when I needed it and extended my interest in communication.

Others were there when I needed them. My wife, Susan, had faith in me when I needed faith. She endured my impositions and responded by helping me. I was obligated to complete this dissertation for her. My mother and family had faith that I would finish and that faith gave me the will to continue. Friends like Pat and Marlynn will be remembered. Sasha and Lucy did not understand my interest in yellow pads but I will again have time for them and their favorite fan.
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CHAPTER I

INTRODUCTION

March and Simon made a final observation in their book, *Organizations*: "The cognitive aspects of organizational behavior are to date almost unexplored terrain."\(^1\) That March and Simon statement is almost as true today as when it was made in 1958. This study is concerned with the unexplored terrain of cognitive process within organizations.

Effective scientific explanations depend upon an adequate theoretical framework. The study of organizations and communication within organizations share a number of common theoretical perspectives. Some of the better known perspectives include scientific management, structural, bureaucratic, human relations, and social systems theories. Each has contributed to our understanding of organizational communication. But these perspectives have originated as theoretical paradigms for studying organizations, not primarily as explanations of organizational communication. In recent years there has been general recognition of the crucial role communication plays in organizational behavior. Communication researchers such as Redding, Goldhaber, and Bantz have been increasingly interested in the development of a theoretical framework which explains organizational communication.
Statement of the Problem

Previous researchers have focused upon the role of communication in organizations. James Miller, Herbert Simon, Karl Weick and others have developed theoretical frameworks for studying organizational communication. These researchers have referred to the operative memory in their descriptions of organizations. But, no comprehensive paradigm of the organizational memory process has been developed. This study will extend the theory of organizational communication by developing a theoretical paradigm for the study of memory. J. Miller indicates the need for such a study when he states: "For most levels of living systems little is known about the rationales of storage, search, and retrieval . . . ."²

Theories of organizational communication leave many questions unanswered. Which theoretical paradigms are most consistent with a communicologist's view of communication? How can the processes of organizations be described in a manner which is consistent with our descriptions of communication? Are there comprehensive theoretical frameworks for describing organizational communication? Is there more than one such theory? If so, which theories provide scientific explanations? Which will encourage the most significant area of research? Fundamentally, which theoretical frameworks should be used for studies of organizational communication?
When the communication process is viewed as the transformation of information, we can identify three possible transformations: the creation of information in the organization or system, the retention of information in organizations, the destruction of information in organizations. Little direct research has been done in these specialized areas because of the theoretical confusions surrounding the concepts.

The research problem then becomes: How can an adequate theoretical paradigm be developed for the study of the memory process in organizational communication? Five related questions emerge. They are: Which major theoretical perspectives should be considered? What are the crucial assumptions of these theories? How are these perspectives related to organizational communication theory? How are these perspectives related to memory theory? Finally, how may we form a theory of the memory process in organizational communication?

March and Simon recognize the need to understand the cognitive processes which help organizations function. March, Simon, J. Miller, and Wiener have assigned a role for organizational memory processes. What seems to be missing is a comprehensive description and explanation of this process. Therefore, it is the purpose of this study to undertake a descriptive-analytic study of theories
organizations As Information Transformers

Although organizations may be described in a number of ways, it is important to identify how organizations will be viewed for the specific purposes of this study. We need a description which leads to an adequate scientific explanation of the communication process in organizations. There is not, however, a single perspective for examining the communication process. There are a number of communication theories which contain several contradictory and incompatible assumptions. Dance (1976) has listed a number of differences between a sampling of these contradictory theories. The vast majority of researchers, though, do accept one element of communication theory. Communication is almost universally described as a "process." Berlo's description (1960) is a classic reflection of the acceptance of the process view of communication.

If we accept the concept of process, we view events and relationships as dynamic, on-going, ever-changing, continuous. When we label something as a process, we also mean that it does not have a beginning, an end, a fixed sequence of events. It is not static, at rest. It is moving. The ingredients within a process interact; each affects all of the others.3
In fact, researchers do not refer to "a process" but to a group of interrelated processes. The interpretation of a group of processes represents an exceedingly complex interaction of elements over time. These interactions are so complex that traditional explanations have not proven adequate. Explanations which are process oriented are needed. Instead of referring to organizations, it appears appropriate to refer to the process of organizing. Organizations are social collectives which exist because of the actions of the people in the organization. Karl Weick (1969) summarizes this perspective regarding the process of organizing.

... assume that there are processes which create, maintain, and dissolve social collectives, that these processes constitute the work of organizing, and that the ways in which these processes are continuously executed are the organization. The same processes operate through a variety of media; they are expressed through whatever props and people are at hand, but they remain basically the same processes. Their appearance may change, but their workings do not. Thus, if you wanted to learn something about an organization, you might look for "interlocked behaviors that are embedded in conditionally related processes."

The unit of analysis is the interlocked behavior pattern, not individuals or physical structures. These behaviors are what we commonly refer to as organizational communication. Human communication constitutes the process of organizing. Organizations emerge from the communication behavior of its members:
The interlocked behaviors . . . are the basic elements which are combined in different ways to compose the processes that accomplish organizing. Each process involved in organizing contains sets of interlocked behaviors. . . .

Although there is wide acceptance of the concept of process, there appears little agreement on how to describe the processes. Several category schemes have been advocated for classifying "subprocesses." One analogy which has been used both in organizational and memory research is the information processing model based upon Shannon's theory of communication. This model analyzes the processing tasks of a computer and transfers these basic tasks or processes to any information processor. George A. Miller (1956) demonstrated the usefulness of the information processing model for the study of attention and memory. Michael Posner (1969) gives a concise statement of the information processing model.

Man receives information from his environment . . . This environmental information is coded by man's sense organs into patterns of neutral excitation, . . . which are then stored . . . and result, finally in patterns of overt behavior . . . . Three forms of information-processing activities may be specified: the conservation or transmission of information, the reduction of information, and the creation or elaboration of information.6

The information processing model, also used by James Miller, is a means for studying organizational communication. This is consistent with the concept that organizations
are a group of processes constituted by the communication behavior of its members. The group of processes can be described as information processors that constitute the process of organizing.

**Procedure**

The procedure followed in this study will be primarily descriptive-analytic. The theoretical foundations which offer the best possible framework for researching organizational memory will be examined. Three theoretical perspectives will be compared. They are: "behaviorism," cybernetics, and general system theory. Such an examination should help clarify the theoretical confusions and contradictions as well as lead to a theoretical formulation which will be adequate for assessing the research material on organizational memory.

The basis for proceeding with the study will be a consistent theoretical paradigm. It will be used to evaluate the present research literature of organizational communication and memory. The paradigm should both clarify confusion in the literature and provide a sound set of data for answering the original problem: how do we explain the operative memory in organizational communication? A theoretical analysis of the research literature will be used to develop a comprehensive theory of memory in
organizational communication. The major purpose of a comprehensive paradigm is the development of an adequate explanation of the operative memory.

The Importance of the Study

This study is significant because it is anticipated that the results will:

1. help clarify theoretical confusions in the literature of organizational communication,
2. extend existing theories of organizational communication by specifically analyzing the memory process,
3. create a more comprehensive explanation of the memory process as it applies to organizational communication,
4. formulate a theoretical perspective which is consistent with the process explanation of organizational communication,
5. create a greater awareness and understanding of human communication in organizational information processing.
In addition to the important aspects associated with this study that have been described, it is also expected that the study will contribute to the theories of communication, organization, and memory.
NOTES


5 Ibid., p. 54.

CHAPTER II

PROCESS

Organizational communication has been studied from a wide variety of theoretical perspectives. The result is a number of explanations which are incompatible. Chapter II will explore the Whiteheadian concept of process. The assumptions which emerge from this analysis will be used to evaluate theories of organizational memory. The theory of the memory process in organizational communication developed in Chapter V will be founded upon the process assumptions of Chapter II. Whitehead's assumptions are used as the criteria for evaluating three major theories of organizational communication: General System Theory (G.S.T.), Cybernetic Theory, and Skinnerian Behaviorism. Ludvig von Bertalanffy's definition of finality will be used to distinguish between various assumptions about process including: structural teleology or purpose, functional teleology or purpose, and creative teleology or purpose. The role of creative teleology will be considered in terms of the three theories of organizational communication. The analysis of Chapter II will be used to formulate a theory of organizational memory which is consistent with the Whiteheadian notion of process. Memory will be explained as a process.
The unifying concept among theories of communication is the statement that communication is a "process." Smith (1972) has examined the role of the "process" concept in communication literature. Although the research literature almost universally maintains a "process" view, there is a great deal of confusion about the meaning of the term process.

If we all—or almost all—agree that communication is a process, and yet if few of our efforts at research employ the process idea perhaps it is time to examine what we mean by the word 'process' and why our theories differ from our studies. Such an examination requires not so much a searching of dictionaries and lexicons as it does a review of our whole concept of science and the phenomena on which our inquiry is focused. For in discussing the nature of our research we are necessarily considering the nature of the world as we decide to view it.1

Alfred North Whitehead in his book *Process and Reality* has given one of the most complete statements about the "process" concept. Whitehead's explanation of process will provide a theoretical framework for evaluating the research literature on organizational communication and the operative of memory.

**Whitehead's Philosophy of Organism**

Whitehead presents a coherent philosophy based upon a "system of ideas."

It is the ideal of speculative philosophy that its fundamental notions shall not seem capable of abstraction from each other. In other words,
it is presupposed that no entity can be conceived in complete abstraction from the system of the universe, and that it is the business of speculative philosophy to exhibit this truth. This character is its coherence. . . . It will also be noticed that this ideal of speculative philosophy has its rational side and its empirical side. . . . One side makes process ultimate; the other side makes fact ultimate.2

Whitehead rejects a purely empirical explanation. All explanations must ultimately relate to the "real" things which make up the world.

'Actual entities'—also termed 'actual occasions'—are the final real things of which the world is made up. There is no going behind actual entities to find anything more real.3

These actual entities are "organisms" which grow, mature, and perish within experience.

**Flux.** Whitehead's analysis of process is based upon a vision of all things in "flux," as opposed to a philosophy of "substance" or "permanence." Process exhibits two kinds of fluency:

One kind is the fluency inherent in the constitution of the particular existent. This kind I have called 'concrescence.' The other kind is the fluency whereby the perishing of the process, on the completion of the particular existent, constitutes that existent as an original element in the constitutions of other particular existents elicited by the repetitions of process. This kind I have called 'transition.' Concrescence moves towards its final cause, which is its subjective aim; transition is the vehicle of the efficient cause, which is the immortal past.4
Whitehead's view of the universe is based upon process as becoming. The essence of the world is in its ever changing character. This is the doctrine of creative advance; the world is ever becoming and ever perishing.

That how an actual entity becomes constitutes what that actual entity is; so that the two descriptions of an actual entity are not independent. Its 'being' is constituted by its 'becoming.' This is the 'principle of process.'

The Notion of Process Replaces the Notion of Static Things. Whitehead's view is not consistent with the 17th, 18th, and the 19th centuries mechanistic concept of process as portrayed by Newtonian physics. The Newtonian concept is a linear, static concept based upon efficient causal analysis with its assumption of enduring substance.

The four categories of explanation, ..., constitute the repudiation of the notion of vacuous actuality, which haunts realistic philosophy. The term 'vacuous actuality' here means the notion of a res vera devoid of subjective immediacy. This repudiation is fundamental for the organic philosophy .... The notion of 'vacuous actuality' is very closely allied to the notion of the 'inherence of quality in substance.' .... It is fundamental to the metaphysical doctrine of the philosophy of organism, that the notion of an actual entity as the unchanging subject of change is completely abandoned .... The positive doctrine of these lectures is concerned with the becoming, the being, and the relatedness of 'actual entities.' An 'actual entity' is a res vera in the Cartesian sense of that term; it is a Cartesian 'substance,' and not an Artistotelian 'primary substance.'
But Descartes retained in his metaphysical doctrine the Aristotelian dominance of the category of 'quality.' All relatedness has its foundation in the relatedness of actualities . . . . 6

The Notions of Determinism and Cause. Webster's Dictionary defines causality as: "the interrelation of cause and effect; principle that nothing can exist or happen without a cause." 7 More succinctly, existence is based upon a cause-effect relationship. The concomitant principle of determinism is: "the doctrine that one's choice of action is not free, but is determined by a sequence of causes independent of his will." 8 The Newtonian physics world view was closely bound to the principles of causality and determinism. The world was conceived in terms of "static" things which would move or change in a sequence of cause-effect relationships. Static things were caused to move within static structures. Newtonian physics viewed the world in terms of the mechanistic analogy of the "clockwork."

There are some important implications and assumptions which are contained in the Newtonian view. 1. It assumes that the world is composed of static things. Movement and process are related to static forms. Thus, the characterization of Newtonian process as a "static process." There is movement and process, but it is a movement of static forms within static forms. 2. It is a "linear"
view because the cause-effect relations are sequential. Events are expected to occur in a definite temporal sequence, with a beginning, middle, and end. Static process occurs in a lineal temporal sequence.

3. Static process views the world in terms of static things moving in static structures. Thus, the characterization of the Newtonian view as mechanistic.

4. The movement of static components within static structural forms could be characterized by purpose. Thus, the characterization of the Newtonian view as functional. Movement occurs "in order to" fulfill a function. Purpose is designed in by the external designer.

5. Movement is determined by causes (not by choice or free will). Thus the characterization of the Newtonian view as determinate. The implication is that the Newtonian view is static, linear, mechanistic, functional and deterministic.

The Newtonian view of the world in terms of deterministic cause-effect relationships is related to Whitehead's notion of efficient cause. There are alternative views of reasons for movement. Whitehead's concept of concrescence introduces the alternative view of causality called final cause.

Whitehead is advocating the process orientation of quantum physics and rejecting the strictly empirical orientation. Whitehead maintains that all explanations are within a metaphysical framework.
But the main objection, dating from the sixteenth century and receiving final expression from Francis Bacon, is the usefulness of philosophic speculation. The position taken by this objection is that we ought to describe detailed matter of fact, and elicit the laws with a generality strictly limited to the systematization of these described details. General interpretation, it is held, has no bearing upon this procedure; and thus any system of general interpretation, be it true or false, remains intrinsically barren. Unfortunately for this objection, there are no brute, self-contained matters of fact, capable of being understood apart from interpretation as an element in a system . . . . Thus one aim of philosophy is to challenge the half-truths constituting the scientific first principles. The systematization of knowledge cannot be conducted in watertight compartments. All general truths condition each other; and the limits of their application cannot be adequately defined apart from their correlation by yet wider generalities.  

Concrescence. Whitehead's concept of process is comprehensive and complex. He is concerned with becoming, being, and relatedness of "actual entities." Actual entities are the final real things of which the world is composed. An "actual entity" or "actual occasion" is nothing but the unity to be ascribed to a particular instance of concrescence. "Concrescence" is the name for "the process," "the production of novel togetherness." The process constitutes the actual entity. The world is a process, and the process is the becoming of actual entities. Concrescence is teleological; it aims towards
final cause, which is its subjective aim. Concrrence is a novel and creative process. It moves from indeterminate potentiality to determinate satisfaction (from the "real" to the "actual"). Process terminates in satisfaction. The "becoming" of concrescence terminates in the "being" of the determinate "superject." The superject (existent) becomes a part of objective immortality (the past).

Three Fold Character of Actual Entities. The notion of process helps clarify Whitehead's three-fold character of an actual entity:

An actual entity has a threefold character. (i) It has the character 'given' for it by the past; The 'objectifications' of the actual entities in the actual world, relative to a definite actual entity, constitute the efficient cause out of which that actual entity arises. (ii) It has the subjective character in its process of concrescence; the 'subjective aim' at 'satisfaction' constitutes the final cause, or lure, whereby there is determinate concrescence. (iii) It has the superjective character . . . .

The "superjective" character represents the "being" of an actual entity. The superject is the satisfaction or completion of the concrescent process, but completion is the perishing of immediacy: "It never really is." The "being" is no longer in process and thus passes into "objective immortality." But as a "being" it has a "potential" for becoming; meaning "beings" have a
potential for being constitutions of other particular existents elicited by repetitions of process. Transition is the origination of the present in conformity with the power of the past. This species of process is called "transition." The transition is the macroscopic process which passes from attained actuality to actuality in attainment. Microscopic process is the conversion of conditions which are merely real (potentially) into determinate actuality.

To sum up: There are two species of process, macroscopic process, and microscopic process. The macroscopic process is the transition from attained actuality to actuality in attainment; while the microscopic process is the conversion of conditions which are merely real into determinate actuality. The former process effects the transition from the 'actual' to the 'merely real'; and the latter process effects the growth from the real to the actual. The former process is efficient; the latter process is teleological. The future is merely real, without being actual; whereas the past is a nexus of actualities. The actualities are constituted by their real genetic phases. The present is the immediacy of teleological process whereby reality becomes actual. The former process provides the conditions which really govern attainment; whereas the latter process provides the ends actually attained.11

Process has a time perspective.

Whenever we attempt to express the matter of immediate experience, we find that its understanding leads us beyond itself, to its contemporaries, to its past, to its future, and to the universals in terms of which its definiteness is exhibited. But such universals, by their very character of universality, embody the potentiality
of other facts with variant types of definiteness. Thus the understanding of the immediate brute fact requires its metaphysical interpretation as an item in a world with some systematic relation to it.12

The past is actual; the future is potential, and the present is a creative teleological process. The "actual" past is characterized by a nexus of "beings", i.e. superjects attained by satisfaction of the past concrescent process. Newton has confused what is "real" potentially with what is actual fact.

Concrescent process is a passing from what is potential to what is actual.

That in the becoming of an actual entity, the potential unity of many entities—actual and non-actual—acquires the real unity of the one actual entity; so that the actual entity is the real concrescence of many potentials.13

The concrescent process involves two meanings of potential.

Thus we have always to consider two meanings of potentiality: (a) the 'general' potentiality, which is the bundle of possibilities, mutually consistent or alternative, provided by the multiplicity of external objects, and (b) the 'real' potentiality, which is conditioned by the data provided by the actual world. General potentiality is absolute, and real potentiality is relative to some actual entity, taken as a standpoint whereby the actual world is defined. It must be remembered that the phrase 'actual world' is like 'yesterday' and 'tomorrow,' in that it alters its meaning according to standpoint.14
Subjective Form. Entities achieve unity because they have "subjective form." An entity relates to the world as it becomes and that relation is individual, subjective.

...An actual entity, on its subjective side, is nothing else that what the universe is for it, including its own reactions. The reactions are the subjective forms of the feelings. An entity relates to the world; Whitehead calls that "relating" prehending. When the entity appropriates some elements in the universe into its internal constitution, it is a positive prehension or "feeling."

Entities feel what is there (in the external, actual world) and transform it into what is here (in the internal, subjective world of the entity). Entities relate to other entities. Entities can relate to other entities by excluding them from synthesis; this is negative prehension. Subjective form and prehension characterize all entities, not only conscious entities.

In each concrescence there is a twofold aspect of the creative urge. In one aspect there is the origination of simple causal feelings; and in the other aspect there is the origination of conceptual feelings. These contrasted aspects will be called the physical and the mental poles of an actual entity. No actual entity is devoid of either pole; though their relative importance differs in different actual entities. Also conceptual feelings do not necessarily involve consciousness; though there can be no conscious feelings which do not involve conceptual feelings as elements in the synthesis.
Thus an actual entity is essentially dipolar, with its physical and mental poles; and even the physical world cannot be properly understood without reference to its other side, which is the complex of mental operations...

A conceptual feeling is feeling an external object in the primary metaphysical character of being an "object," that is to say, feeling its capacity for being a realized determinant of process.\textsuperscript{16}

Physical feelings (relations) and conceptual feelings (relations) introduce two distinct forms of causality. Each process or each entity in the process of becoming has a mental, conceptual pole which is related to Whitehead's concept of final cause. The mental pole, i.e. subjective pole, accounts for the indeterminate nature of process. The physical pole accounts for the determinate nature of process, which is characterized by the past determining or causing the present.

The Category of the Ultimate. Whitehead's explanation of process involves three notions which he refers to as the Category of the Ultimate. \textit{Creativity} is one notion; the other two notions are \textit{many} and \textit{one}. The notion of \textit{creativity} is essential to an understanding of process. "Things" do not create the world. The world is a complex of entities in the process of becoming. The universe constitutes a disjunctively diverse many.
Entities in the process of becoming unify the many into the novel one, Whitehead's concrescence. Starting with disjunctive diversity, the world is ever in the process of becoming into a unity of one. "The one" is added to the disjunctive diversity to again be unified by concrescence. This process is what Whitehead calls the creative advance of entity to entity. Each concrescence involves a physical pole and a mental pole.

The physical pole is that aspect of an entity which makes no contribution of its own. It merely receives what is given by its past. Simple occasions constitutive of inanimate material objects are largely determined by causal efficacy; the entities subjective decisions are negligible.

The more complex occasions involving animate objects place a greater emphasis on the creative decisions of the mental pole. But it must be remembered that all entities are dipolar, although their relative importance differs in different actual entities. Whitehead also emphasizes the fact that mental operations are not inherently conscious. Consciousness is a product of integration at a level beyond the two essential phases.

"Becoming". Entities "become" by a process that involves the determination of efficient cause and by the
self-determination of final cause. An entity unifies the determination of the past and the self-determination of subjective form. Once an entity has made a decision about its form of self-determinism, it is no longer indeterminate. The process terminates. The process terminates its "becoming" in one complex feeling involving a determinate bond with every item in the universe. This determination is the "satisfaction" of the actual entity and represents the achievement of final cause. At this point the entity is no longer a subject becoming; it is a "superject," i.e. the being. The unified one of the superject is added to the disjunctive unity of the universe. By transcendence an entity passes into objective immortality and adds a determinate condition to the settlement for the future beyond itself. The actual entity has "perished" when it is complete. The universe is composed of entities that are continually completing themselves and continually perishing. Thus the universe is "perpetually perishing." The entity's birth is its end, but it is immortal because its objec-
tification as a superject has been added to the disjunctive unity of the universe. The universe is a unity composed of disjunctive potentialities which become the unified one of satisfaction. As a part of the disjunctive unity,
the superject has the "potential" for being reintegrated into the process of actual entities in the future.

The potentialities or possibilities which exist in the universe are referred to as "real" by Whitehead. Potential becomes "actual" when the process terminates in satisfaction. At this point the actual entity has passed from the indeterminate process state to the determinate actual state. The actual entity has "perished" and passed into a superject which becomes a part of objective immortality. Many of these concepts are summarized in the "Ontological Principle."

That every condition to which the process of becoming conforms in any particular instance, has its reason either in the character of some actual entity in the actual world of that concrescence, or in the character of the subject which is in process of concrescence. This category of explanation is termed the 'ontological principle.' It could also be termed the 'principle of efficient, and final causation.' This ontological principle means that actual entities are the only reasons; so that to search for a reason is to search for one or more actual entities. It follows that any condition to be satisfied by one actual entity in its process expresses a fact either about the 'real internal constitutions' of some other actual entities, or about the 'subjective aim' conditioning that process.17

Novelty. Becoming is a creative advance into novelty. Efficient cause explains the past's determination of the present, but it does not explain novelty.
Whitehead's concept of final cause explains the introduction of novelty. Entities in the process of becoming unify the many into one. Unity is achieved through the subjective form of the entity. The entity achieves unity by subjectively relating to what the universe is for it. It unifies "what might be" with "what is."

The unifying process is called concrescence. An instance of concrescence is called an actual entity.

Each instance of concrescence is itself the novel individual 'thing' in question. There are not 'the concrescence' and the 'novel thing': when we analyze the novel thing we find nothing else but the concrescence.\(^\text{18}\)

An instance of concrescence is a process, not a substance; an actual entity is a process called concrescence.

Concrescence introduces novelty through its subjectivity.

The process is nothing else than the experiencing subject itself. In this explanation it is presumed that an experiencing subject is one occasion of sensitive reaction to an actual world.\(^\text{19}\)

The concrescent process must relate to the actual world (the ontological principle). An actual entity "feels" (relates) to the physical universe and thus is constituted or determined by the possibilities of the physical universe (the "physical pole"). The process is also determined by the actual entity's own subjective form (the "mental pole"). The indeterminate subjective form determines
its final form, i.e. satisfaction by the choices, i.e. prehensions, it makes. This second phase of process is what introduces novelty. A conceptual feeling is a feeling (or relation) whose datum is an "external object, or potentiality. Physical feelings are feelings (or relations) or actual entities. Whitehead defines "external objects" in terms of actual entities.

External Objects.

The things which are temporal (actual entities) arise by their participation in the things which are external (eternal objects). . . . If the term 'external objects' is disliked, the term 'potentials' would be suitable. The external objects are the pure potentials of the universe; and the actual entities differ from each other in their realization of potentials. Any entity whose conceptual recognition does not involve a necessary reference to any definite actual entities of the temporal world is called an 'external object.' An external object is always a potentiality for actual entities; but in itself, as conceptually felt, it is neutral as to the fact of its physical ingress in any particular actual entity of the temporal world.20

Actual entities and external entities are the two fundamental types of entities. The actual entity makes its subjective decision about its final unity through conceptual feelings. Whitehead refers to unity as "contrast;" to set in "contrast with" means to put in a "unity with." All physical feelings have corresponding conceptual feelings.
From each physical feeling there is the derivation of a purely conceptual feeling whose datum is the external object exemplified in the definiteness of the actual entity, or the nexus, physically felt. . . . The mental pole originates as the conceptual counterpart of operations in the physical pole. The two poles are inseparable in their origination. The mental pole starts with the conceptual registration of the physical pole.21

Valuation and Subjective Aim. Concrescence involves a subjective feeling (or relation) to the datum. The subjective form of a conceptual feeling is "valuation."

The subjective form of a feeling is how that feeling feels its datum; . . . . In the case of conceptual feelings, the subjective form is therefore how the datum external objects is felt. "Valuation" is the name for this "how" of feeling in the case of conceptual feelings.22

Subjective form of entities is determined by the "subjective aim", i.e. final cause of actual entities. Subjective aim is a decision by the subjective form of the actual entity about which external objects (potentialities) will be felt and which external objects will be eliminated.

It follows that balanced complexity is the outcome of this final category of subjective aim. Here 'complexity' means the realization of contrasts, and so on; and 'balance' means the absence of attenuations due to the elimination of contrasts which some elements in the pattern would introduce and other elements inhibit. Unless there is complexity, ideal diversities lead to physical impossibilities, and hence to impoverishment. . . . The subjective aim is the selection of the balance amid the given materials.23
This decision about what is included and what is excluded in the unity of feeling (the actual entity) introduces novelty.

The subjective form of a conceptual feeling is valuation. These valuations are subject to the Category of Subjective Unity. Thus the conceptual valuation introduces creative purpose. The mental pole introduces the subject as a determinant of its own concrescence. The mental pole is the subject determining its own ideal of itself by reference to external principles of valuation autonomously modified in their application to its own physical objective datum.24

The subjective form of an actual entity decides which potentialities will enter its felt unity and in so doing determines its own reason, 'causa sui.'

But the admission into, or rejection from, reality of conceptual feeling is the originative decision of the actual occasion. In this sense an actual occasion is causa sui.25

Aim Towards Order. Whitehead's view of process maintains the notion that the world aims towards order. The ultimate metaphysical principle is the advance from disjunction and disorder to conjunction and order. "The many" are unified and ordered into "the one." Indeterminism of process evolves into determinate satisfaction. Thus, the satisfaction is the attainment of final cause, and process is "animate by" or teleologically "aimed at" final cause.
Implications of Whitehead's Notion of Process

Whitehead's notion of process is not based upon Newtonian assumptions. The Newtonian concept of static things moving within static structures is not compatible with Whitehead's notion of actual entities emerging from a subjectively creative process. The Newtonian concept is based upon a functional analysis of purpose. The Whiteheadian analysis is based upon a creative teleology or "true process;" it is a process of emerging entities, not a process of static structure.

Whitehead has used the findings of quantum physics to improve upon the theoretical perspective of Newtonian physics. The Whiteheadian notion of process provides assumptions and criteria for evaluating the theoretical frameworks used to explain organizational communication. The organizational processes from which organizational memory emerges will be explained in terms of the Whiteheadian notion of process.

Criteria for a Process Analysis

Whitehead's analysis of process suggests several concepts which will be used to explain memory. The following criteria will define process for the purpose of this study. Seven concepts are given:

1. The world is viewed as "the flux of things" instead of the alternative notion of "permanent things." The emphasis is on flux not substance. Change is essential
to process. Whitehead rejects the scientific materialist notion that one enduring thing is self-identical over time. He replaces it with the notion of a pluralistic universe that is a process of creative advance into novelty. There is not a permanence of substance, but there is a permanence of order.

In the world there is nothing static. But there is reproduction; and hence the permanence which is the result of order, and the cause of it. And yet there is always change; for time is cumulative as well as reproductive, and the cumulation of the many is not their reproduction as many.26

Each actual entity preserves the determinism and order that it prehends, but its subjective reaction creates novelty and change.

2. The universe moves towards order. This is the basis of the creative teleological explanation of final cause. Order is the permanence of "form", not "substance". The aiming towards order is the basis for Whitehead's explanation of final cause. But in the process of "becoming" each actual entity has a capacity for novelty or change. The notion of change is meaningless unless there is something which changes, and for Whitehead it is a changing of relations of form.

3. Explanations of relationships are essential. There has been an unbalanced emphasis upon empirical, efficient causal explanations. Whitehead rejects such purely
mechanistic, Newtonian explanations with their dependence upon linear and static notions. Whitehead emphasizes a process which relates the disjunctive diversity of the universe into the conjunctive unity of concrescence.

4. There is an actual world which exists independently of the perceiver. The actual entities are the final real things of which the world is made up.

5. Process is constituted of a past, present and future. The present assumes a past of stubborn fact and a future of potentialities.

6. Explanations of process must account for final causality.

7. The universe is perpetually perishing; it is a creative advance into novelty.

Causality and Teleology. The concept of process is closely related to causality and teleology. There is as much confusion over the meaning of causality as there is over the meaning of process. There are a number of ambiguous meanings of cause. Any discussion of cause requires a careful definition of the various meanings of causality.

The definitions of cause put forth at this point are meant to be an introduction. There are numerous extensions of these definitions. Such extensions will not be introduced, however, unless they are relevant to the present discussion.
The concepts of efficient cause and final cause were first clearly established in Aristotle's *Metaphysics*. He described four causes: 1. material cause, 2. formal cause, 3. efficient cause, and 4. final cause. Most discussions of cause are related to these four causes. There are a number of interpretations involving Aristotle's four notions of causality. The emphasis in interpretations is usually upon relatedness. In what sense does cause infer relationships, and what relationships can be called causal? Such questions are central to the interpretation of the two key notions of efficient cause and final cause. Efficient cause is the notion of cause adopted by Newton. It views cause as being deterministic; the present is determined by the past. The explanation of cause is an explanation of the conditions which are necessary and sufficient;

We might, for instance, define cause as:

* a nonsufficient condition without which an event would not have happened, or as a member of a set of jointly sufficient reasons without which the event would not happen . . . .27*

Hume modified this concept, and he stated the empirical view of causality. Empiricism has accepted Hume's critique:

* . . . that necessary connections among events cannot be perceived (and hence can have no empirical basis). Observation reveals only recurring associations. The proposition that*
it is possible to discover associations among events that are, in fact, invariable ceases to be a provable statement about the natural world and becomes instead a working rule to guide the activity of the scientist. He says, 'I will seek for relationships among events that seem always to hold in fact, and when it occurs that they do not hold, I will search for additional conditions and a broader model that will (until new exceptions are discovered) restore my power of prediction.'

The empirical test of an explanation is its ability to predict. The empirical, mechanistic concept of functional cause is based upon an explanation of past events and a prediction of future events. The past determines the present, and the past and present determine the future. Therefore, an adequate explanation of the past will explain what will happen in the future.

Whitehead disagrees with Hume's concept of functional causality. The notion of final cause rejects the notion that the present and future are determined solely by the past. Final cause posits an alternative form of determination. Final cause suggests that the individual or natural order can determine the direction of the universe. Teleology suggests that behavior is "aimed" at something. Final cause suggests that it is aimed at a final cause. The notions of final cause, teleology, and purpose can be equivalent or there can be a differentiation of notions if additional criteria are provided for distinguishing between the notions.
Each of the three theoretical perspectives to be considered in this study can be compared to Whitehead's notion of causality and teleology. This comparison will clarify the causal and teleological assumptions of these perspectives, and it will also serve to clarify their theoretical assumptions in light of Whitehead's concept of process. Each theoretical perspective will be compared to Whitehead's concept of process. Ludvig von Bertalanffy presents a general or open systems formulation of cause and teleology. Norbert Wiener explains the position of cybernetics and information theory. B. F. Skinner discusses these concepts in relation to the behaviorism associated with operant conditioning.

**General System Theory and Process**

Bertalanffy was motivated to develop a new theoretical formulation for the same reason that Whitehead developed his concept of process. Bertalanffy felt the efficient causal explanations of Newtonian physics were inadequate when applied to the biological and social sciences.

Nevertheless, the necessity and feasibility of a systems approach became apparent only recently. Its necessity resulted from the fact that the mechanistic scheme of isolable causal trains and meristic treatment had proved insufficient to deal with theoretical problems. . . .

The only goal of science appeared to be analytical, i.e., the splitting up of reality into ever smaller units and the isolation of individual causal trains.
... We may state as characteristic of modern science that this scheme of isolable units acting in one-way causality has proved to be insufficient. Hence, the appearance, in all fields of science, of notions like wholeness, holistic, organismic, gestalt, etc., which all signify that, in the last resort, we must think in terms of systems of elements in mutual interaction.

Similarly, notions of teleology and directiveness appeared to be outside the scope of science and to be the playground of mysterious, supernatural or anthropomorphic agencies; ... Nevertheless, these aspects exist, and you cannot conceive of a living organism, not to speak of behavior and human society, without taking into account what variously and rather loosely is called adaptiveness, purposiveness, goal-seeking and the like.29

Bertalanffy introduces the concepts of teleology, purposiveness, and goal-seeking in his discussion of finality. For Bertalanffy the notions of teleology and directiveness are explained by the notions of finality or final state. The notion of finality holds that a system's variation can be explained not only by actual conditions (efficient cause, past), but its variation can also be expressed in terms of the distance from the stationary state (the "final cause" or final state).

In case a system approaches a stationary state, changes occurring may be expressed not only in terms of actual conditions, but also in terms of the distance from the equilibrium state; the system seems to "aim" at an equilibrium to be reached only in the future. Or else, the happenings may be expressed as depending on a
future final state. . . . Finality can be spoken of also in the sense of dependence on the future . . . happenings can, in fact, be considered and described as being determined not by actual conditions, but also by the final state to be reached.30

Bertalanffy's concept of the final state determining the "becoming" has led to some misunderstandings. It is not an argument for vitalism. The finalistic process is not the same as human foresight of the goal. The final-value formula is derived from a growth equation that uses a notion of time determined by actual conditions.

In this equation, the process at time \( t \) is determined only by the actual conditions and no future state appears. . . . The "teleological" final-value formula therefore is only a transformation of the differential equation indicating actual conditions. In other words, the directedness of the process towards a final state is not a process differing from causality, but another expression of it. The final state to be reached in future is not a 'vis a fronte' mysteriously attracting the system, but only another expression for causal 'vi res a tergo.'31

This formulation of creative final cause, based upon a final state that aims or directs behavior, is not a rejection of causality. It is a reformulation of causality that extends the concept of efficient cause by adding the concept of final cause. The formulation overcomes the objections to the dependence of an existent on a non-existent.
... finality was defined as the reverse of causality, as dependence of the process on future instead of past conditions. This was frequently objected to because, according to this conception, a state A would depend on a state B in the future, an existent on a non-existent (e.g., Gross 1930; similarly Schlick). As the above shows, this formulation does not mean an inconceivable 'action' of a not existent future, but merely sometimes useful formulation of a fact which can be expressed in terms of causality.32

It is clear that finality, causality, and teleology are closely related and interdependent terms according to Bertalanffy. Confusion over the various types of finality has often resulted in contradictory theoretical assumptions. Bertalanffy distinguishes among several types of finality:

1) [a] Static teleology or fitness, meaning that an arrangement seems to be useful for a certain "purpose" . . . .

2) [b] Dynamic teleology, meaning a directiveness of process . . . .

(i) Direction of events towards a final state which can be expressed as if the present behavior were dependent on that final state . . . .

(ii) Directiveness based upon structure, meaning that an arrangement of structures leads the process in such way that a certain result is achieved. This is true, of course, of the function of man-made machines . . . . We find a structural order of processes . . . These regulations are governed, in a wide extent, by feedback mechanisms. . . 'servo-mechanisms.' Feedback mechanisms
appear to be responsible for a large part of organic regulations and phenomena of homeostasis, as recently emphasized by Cybernetics . . . .

(iii) There is, however, yet another basis for organic regulations. This is equifinality—i.e., the fact that the same final state can be reached from different initial conditions and in different ways. This is found to be the case in open systems, insofar as they attain a steady state. It appears that equifinality is responsible for the primary regulability of organic systems—i.e., for all those regulations which cannot be based upon predetermined structures or mechanisms, but on the contrary, exclude such mechanisms and were regarded therefore as arguments for vitalism.

(iv) Finally, there is true finality or purposiveness, meaning that the actual behavior is determined by the foresight of the goal. This is the original Aristotelian concept. It presupposes that the future goal is already present in thought, and directs the present action. True purposiveness is characteristic of human behavior, and it is connected with the evolution of the symbolism of language and concepts (von Bertalanffy, 1948a, 1965).

The confusion of these different types of finality is one of the factors responsible for the confusion occurring in epistemology and theoretical biology. In the field of man-made things, fitness (a) and teleological working of machines (b, ii) are, of course, due to a planning intelligence (b, iv). Fitness in organic structures (a) can presumably be explained by the causal play of random mutations and natural selection. This explanation is, however, much less plausible for the origin of the very complicated organic mechanisms and feedback systems (b, ii).
Vitalism is essentially the attempt to explain organic directiveness (b, ii and iii) by means of intelligence in foresight of the goal (b, iv). This leads, methodologically, beyond the limits of natural science, and is empirically unjustified, since we have, even in the most astonishing phenomena of regulation or instinct, no justification for, but most definite reasons against, the assumption that for example an embryo or an insect is endowed with superhuman intelligence. 33

The mistake of the vitalists is the confusion of type (b, iv) foresight of the goal with type (b, ii and iii).

Bertalanffy's concept of finality contains several notions and theoretical assumptions which help to explain the notion of process, cause, teleology, and purpose. Teleology, final cause, purpose, and finality all have several distinct meanings. The confusion of these multiple meanings has led to theoretical confusions. Bertalanffy's definition of static teleology and the four types of dynamic teleology helps to distinguish theoretical assumptions.

**Types of Teleology.** Static teleology 1[a] or fitness refers to an arrangement of the static structures (or static things). "Purpose" is defined by the "reason" for a specific arrangement, i.e. "structural purpose or teleology." The reason or "purpose" must be given by an external "designer." The designer can be a man, evolution or S-R learning, but it is given by external factors.
Dynamic teleology 2[b] has four distinct meanings. 2[b]i and 2[b] iv are for the purposes of this discussion, less relevant than 2[b]ii and 2[b]iii. The commonly held concept of purpose as foresight of the goal (or intent) 2[b]ii is not the definition of purpose or teleology adopted by Bertalanffy. "Intentional purpose or teleology" is identified with human purpose.

Dynamic teleology 2[b]ii is an example of "functional purpose or teleology." This explanation is related to the Newtonian view of static forms moving within static forms "in order to" fulfill some given function. The purpose, reason or function was established by an external "designer" or external factors which served as a designer. Purpose is defined by the concept of efficient causality or cause-effect relationships. Final conditions were determined by past or initial conditions, i.e. equilibrium. The choice of action is determined by a sequence of causes independent of will or causa sui, i.e. self cause. Cause is externally determined not internally determined.

Functional purpose is exemplified by the clock or man-made machine with its static components moving within predetermined structural arrangements or forms, "in order to" fulfill the goals of its designer. Functional teleology is appropriately characterized as a mechanistic explanation. The systems behavior is controlled or regulated by designed
in goals which direct behavior through feedback mechanisms. Functional teleology is characterized by the concept of equilibrium.

Dynamic teleology is an example of "creative purpose or teleology." This explanation is related to the Whiteheadian idea of process; "being is constituted by becoming." The system is self-caused, i.e. _causa sui_. The purpose, reason or goal was established by the internal relationships within the system. Teleology was characterized by final cause and _equifinality_, i.e. the same goal may be reached from different initial conditions and in different pathways. Systems are not predetermined by efficient cause-effect relations, but instead they emerge from the internal relationships of final causality. Creative teleology is characterized by the concept of equifinality.

Bertalanffy also uses the concept of finality to distinguish open systems and closed systems. Open systems are characterized by equifinality, and closed systems are characterized by equilibrium.

One fundamental difference is that closed systems must eventually attain a time-independent state of chemical and thermodynamic equilibrium; in contrast, open systems may attain, under certain conditions, a time-independent state which is called a steady state, _Fliessgleichgewicht_, using a term which I introduced some twenty years ago. In the steady state, the composition of the system remains constant in spite of continuous exchange.
of components. Steady states or Fliessgleichgewichts are equifinal i.e., the same time-independent state may be reached from different initial conditions and in different ways—much in contrast to conventional physical systems where the equilibrium state is determined by the initial conditions.34

Closed systems are determined by initial conditions; they "react," and thus ultimately they are explained by efficient cause. Open systems are determined, in part, by the characteristics of the system. Open systems have an "identity" which helps to determine their outcome; they are "active."

Whitehead's notion of process is closely associated with Bertalanffy's concept of creative teleology 2[b]iii. The creative teleological system "aims" at its final cause. The purpose or goal of the system is determined by its final cause, i.e. mental pole. The system emerges and is constituted by process, i.e. concrescence. Open systems are equipotential; there are many potential paths for reaching a final state, i.e. satisfaction. Process moves from indeterminate potentiality to determinate satisfaction. The equifinal system is indeterminate because there are many potential paths which may emerge. The system or actual entity is constituted by the process of choice. The internal characteristics of the system, i.e. subjective form and subjective aim, i.e. final cause, determine which choices are made from the potential choices.
Each system and entity is unique. Each has its own subjective form. The choices which emerge from the entity's subjective form are what introduces novelty and creativity. Entities and systems are novel because of creative teleology. Whitehead calls the creative teleology of an entity its mental pole.

But each entity combines both the creative mental pole with the determinate physical pole. The efficient causality of the physical pole limits the potential choices available to the creative mental pole. The objective immortality of the actual world determines which choices are available to the mental pole. Objective immortality determines which potential choices are available. It provides both potential choices and limits on those choices. The physical pole can be characterized both by the potential choices it makes available or by the limits it places on those potential choices. The mental pole is characterized by its ability to choose among the potential choices. Thus, the mental pole introduces novelty and creativity. The mental pole is represented by the "aim" of final cause which serves as a criteria for choice, and the physical pole is represented by past choices and limits of efficient cause.

The emergence of the entity is a result of both the indeterminate final cause and the determinate efficient cause. Teleology and purpose are concepts for
explaining why an entity has a specific final form. Its final form is selected or chosen by the teleological nature of the concrescent process. The goals of final causality determine which choices are made. But, the entity is indeterminate because many potential choices are available. When the subjective form makes the choices and the entity completes the concrescent process, the entity passes into determinant objective immortality to play a role in the transition process. The important distinction between functional teleology and creative teleology is in terms of how choices are determined. In functional teleology choice is explained in terms of purposes set by past conditions as determined by efficient cause. In creative teleology choice is determined by the purposes of final cause.

Teleology controls the behavior of the entity by determining which goals or signals will determine which selections will be made. Teleology determines goals and purpose; and purpose determines outcome. Teleology gives a criteria for determining which "paths" are "most valuable." The paths which help achieve the teleological purpose are more valuable than those paths which are less capable of achieving the purpose. Thus, teleology and purpose regulate the paths which are chosen. Creative teleology and final cause are a result of the dynamic
interaction of the system or entity. Functional teleology and efficient cause are a result of past choices and designed in externally set purposes. Bertalanffy distinguishes between the creative teleology of primary regulation and the functional teleology of secondary regulation:

It can be shown that the primary regulations in organic systems, i.e., those which are most fundamental and primitive in embryonic development as well as in evolution, are of the nature of dynamic interaction. They are based upon the fact that the living organism is an open system, maintaining itself in, or approaching a steady state. Superposed are those regulations which we may call secondary, and which are controlled by fixed arrangements, especially of the feedback type. This state of affairs is a consequence of a general principle of organization which may be called progressive mechanization. At first, systems—biological, neurological, psychological or social—are governed by dynamic interaction of their components; later on, fixed arrangements and conditions of constraint are established which render the system and its parts more efficient, but also gradually diminish and eventually abolish its equipotentiality. Thus, dynamics is the broader aspect, since we can always arrive from general system laws to machinelike function by introducing suitable conditions of constraint, but the opposite is not possible. 35

Entities become as a result of both primary and secondary regulation. But, explanations are inadequate if they only consider secondary regulations. The explanation must also account for primary regulation. Novelty is accounted for by primary regulation.
Teleological purpose can be used to distinguish theoretical positions and assumptions. Explanations which explain purpose in terms of the arrangement of static components in three dimensional space are **structural teleological**. Explanations which explain purpose in terms of static forms moving in predetermined paths within static forms are **functional teleological**. The mechanistic "process" of the Newtonian view is an example of a functional explanation. It is characterized by a sequence of cause-effect relationships, i.e. efficient causality. Explanations which explain purpose in terms of creative emergence are **creative teleological**. The dynamic, process of the Whiteheadian view is an example of creative teleology. It is characterized by the equifinal relationships of final causality.

Finality, cause, and process all have many distinct meanings. The definitions adopted are critical components of theoretical assumptions and theoretical paradigms. Bertalanffy's theory of general and open systems are compatible with Whitehead's formulation of the notion of process:

1. Bertalanffy's concepts of growth and change are an expression of the flux concept.
2. Organization and order are fundamental assumptions of general system theory.
An atom, a crystal, or a molecule are organizations, as Whitehead never failed to emphasize. In biology, organisms are, by definition, organized things. . . . Characteristic of organization, whether of a living organism or a society, are notions like those of wholeness, growth, differentiation, hierarchical order, dominance, control, competition, etc. Such notions do not appear in conventional physics. System theory is well capable of dealing with these matters.\(^\text{36}\)

3. Bertalanffy's theory is based upon relations, not structure. "A system can be defined as a set of elements standing in inter-relations."\(^\text{37}\)

4. General system theory accepts the relevance of physical characteristics of systems.

5. The concept of equifinality relates past, present, and future.

6. The concept of finality would go beyond a purely efficient causal explanation.

7. General system theory accounts for novelty. It uses a process perspective, which is compatible with Whitehead's views.

**Cybernetic Theory and Process**

Cybernetic theory was first formulated by Norbert Wiener. Wiener draws upon Shannon's Information Theory as a part of cybernetic theory. The basic assumption of cybernetic theory is that the world obeys the Second Law
of Thermodynamics: confusion increases and order
decreases. Entropy represents an increase in uncer-
tainty and increasing disorder.

As entropy increases, the universe, and
all closed systems in the universe, tend
naturally to deteriorate and lose their
distinctiveness, to move from the least
to the most probable state, from a state
of organization and differentiation in
which distinctions and forms exist, to
a state of chaos and sameness. In Gibbs' universe order is least probable, chaos
most probable.38

Cybernetics uses a mechanistic analogy; a comparison
of machines and living organisms.

Thus the nervous system and the automatic machine are fundamentally alike in that they are devices which make decisions on the basis of decisions they have made in the past . . . . The machine, like the living organism, is, as I have said, a device which locally and temporarily seems to resist the general tendency for the increase of entropy. By its ability to make decisions, it can produce around it a local zone of organizations in a world whose general tendency is to run down.39

According to cybernetic theory, both man and machines are able to fight entropy by using feedback.

Feedback, the property of being able to adjust future conduct by past performances. Feedback may be as simple as that of the common reflex, or it may be a higher order feedback, in which past experience is used not only to regulate specific movements, but also whole policies of behavior to be what we know under one aspect as a condi-
tional reflex, and under another as learning.40
Negative Feedback

Cybernetic theory maintains that the world tends towards a final state characterized by entropy. The movement of the cybernetic system is towards chaos and disorder. Cybernetics extends the concept of efficient cause with a concept of circular causal chains. Causality is represented by Gibbs statistical mechanics and therefore represented as probability. Feedback of information to a control or decision maker is the key to understanding Wiener's view of purpose. Wiener's cybernetic system has an input which is transformed by the system and becomes output. Output is "fed-back" to the control which contains an expected output (or goal) that is compared to the actual output. The control then reads the "error" between expected output and actual output. The control then takes actions to reduce error. This process is called negative feedback by Wiener, and it represents purposeful behavior. The purposeful machine is called a servomechanism and is a form of self-regulation.

Feedback is then negative, that is, the signals from the goal are used to restrict outputs which would otherwise be beyond the goal. It is this second meaning of the term feedback that is used here.

All purposeful behavior may be considered to require negative feedback. If a goal is to be attained, some signals from the goal are necessary at some time to direct the behavior.41
Kelley diagrams this purposeful cybernetic system in Fig. 1.

Figure 1. Cybernetic System: Kelly.

Negative feed-back maintains the system by making decisions about the action of the system based upon a registering error between expected output and actual output. The system selects actions on the basis of error and feedback. The control determines the actions of the system and is in this sense purposeful. Several concepts are necessary to such an explanation; input, output, expected output or goal, transformation, control, decision, selection, memory, feedback, and learning.

Evolution and natural selection are examples of random selection; evolution leaves a residual pattern of forms. "This residual pattern, according to Darwin, assumes the appearance of universal purposiveness." But, it is not purposeful. Ernst Mayr would not call such functional concepts of teleology "purpose." "The development or behavior of an individual is purposive, natural selection is definitely not." Wiener advocates Ashby's idea of the learning machine as explaining purpose because it is based upon a concept of negative feedback.
The result is that in Ashby's machine, as in Darwin's nature, we have the appearance of a purposefulness in a system which is not purposefully constructed simply because purposelessness is in its very nature transitory. Of course, in the long run, the great trivial purpose of maximum entropy will appear to be the most enduring of all. . . . I believe that Ashby's brilliant idea of the unpurposeful random mechanism which seeks for its own purpose through a process of learning is not only one of the great philosophical contributions of the present day, but will lead to highly useful technical developments in the task of automatization. Not only can we build purpose into machines, but in an overwhelming majority of cases a machine designed to avoid certain pitfalls of breakdown will look for purposes which it can fulfill.45

This concept of purpose is based upon a concept of a random machine that introduces purpose by control. Wiener does not equate purpose and causality. Wiener maintains that his concept of teleology is independent of efficient causality or final causality.

In classifying behavior the term 'teleology' was used as synonymous with 'purpose controlled by feed-back.' Teleology has been interpreted in the past to imply purpose and the vague concept of a 'final cause' has been often added. This concept of final causes has led to the opposition of teleology to determinism. A discussion of causality, determinism and final causes is beyond the scope of this essay. It may be pointed out, however, that purposefulness, as defined here, is quite independent of causality, initial or final . . . . a teleological study is useful if it avoids problems of causality and concerns itself merely with an investigation of purpose.46
If causality is determinism, then negative feedback is a form of determinism. Negative feedback is not a form of "classic" causality, but it is consistent with Bertalanffy's concept of functional purpose. Wiener, however, chooses to avoid terms such as final cause or creative purpose.

John Y. Kim explains why the cybernetic definition of teleology is inadequate. The cybernetic definition excludes all behaviors which are not described as feedback systems with their internal control mechanism and the necessary internal "goal" or expected output. The goal is programmed by external "designers."

The cybernetic redefinition of teleology, nevertheless, appears to be limited in the same sense as classical physics, which simply concluded that there were no teleological phenomena in reality. For the cyberneticist, certain 'non-feedback'—yet obviously purposeful—behaviors are simply understood to be 'outside the scope of science,' so to speak, by being defined out of the realm of teleological behavior. Thus, if the cyberneticist wants to study these categories of purposeful behaviors, they have to be reduced either to the language of feedback or that of the classical mechanical theories.47

Kim explains that the limitations of the teleology concept, as defined by cybernetics, are based upon the mechanistic and closed system assumptions of cybernetics.

The core problem is that the feedback concept originating in hard sciences is typically cast in linear, unidirectional, and mechanistic terms. In contrast, human communication is conceived to be multilateral, organic, and mutual causal in nature. Thus, although the notion of feedback has been
expounded by systems-oriented social scientists, a problem arises owing to the incompatibility between the mechanistic conception of feedback and the systemic conception of human communication processes. Although feedback has been credited with resolving the classical problem of linear causality by introducing the circularity in the causal chain, it still is based upon the mechanistic and closed-system premises. Such an explanation of feedback implies two important closed system properties: the causal relationship between the component units is one-way, and the relationship of the whole system with its environment is an independent one. Thus, one finds that feedback at its basic level is a closed system concept.

The Distinction Between Cybernetic Theory and General System Theory

Cybernetic and general system theory are often equated. Bertalanffy clearly states that the two theories are two different model concepts.

Systems theory also is frequently identified with cybernetics and control theory. This again is incorrect. Thus dynamics in open systems and feedback mechanisms are two different model concepts, each in its right in its proper sphere. Ultimately, the pair is a modern expression of the ancient antithesis of 'process' and 'structure'; it will eventually have to be resolved dialectically in some new synthesis.

Bertalanffy supplies a number of characteristics which are the basis for his differentiation of cybernetic and general system theory. Feedback control systems:

1. are structural and mechanistic, 2. have linear and unidirectional causality, and 3. have a closed metabolism.
The following appear to be the essential criteria of feedback control systems:
Regulation is based upon preestablished arrangements ('structures' in a broad sense). This is well expressed by the German term Regelmechanismen which makes it clear that the systems envisaged are of the nature of 'mechanisms' . . . .
Causal trains within the feedback system are linear and unidirectional. The basic feedback scheme is still the classical stimulus-response (S-R) scheme, only the feedback loop being added so that causality becomes circular . . . . Typical feedback or homeostatic phenomena are 'open' with respect to incoming information, but 'closed' with respect to matter and energy. The concepts of information theory—particularly in the equivalence of information and negative entropy—correspond therefore to 'closed' thermodynamics (thermostatics) rather than irreversible thermodynamics of open systems . . . . a feedback system is closed thermodynamically and kinetically; it has no metabolism.50

Bertalanffy's statement about "active" and "reactive" states of higher organization clarifies a difference between open systems and closed cybernetic systems.
Open systems actively reach finality because the conditions of the system lead to a creative teleological directing or determining of the system's behavior.
The feedback systems "react" to the mechanical forces of the system.

An open system may 'actively' tend toward a state of higher organization, i.e., it may pass from a lower to a higher state of order owing to conditions in the system. A feedback mechanism can 'reactively' reach a state of higher organization owing to 'learning', i.e., information fed into the system.51
There are several problems with Wiener's concept of purpose or teleology when it is compared to Whitehead's concept of process. Closed system models place too much emphasis upon structure and entropy.

Cybernetic theory does not meet the Whitehead's process criteria because of the following analysis:
1. Wiener does attempt to explain change but there is an underlying structural functional emphasis in cybernetics. 2. The concept of the movement towards entropy or disorder is in direct conflict with Whitehead's concept of aiming towards order. 3. Cybernetics emphasizes mechanistic, functional and linear causality, and thus deemphasizes creative teleology. 4. Cybernetics accepts the concept of the real world. 5. Cybernetics emphasizes the past by its closed systems assumptions with their emphasis upon initial conditions. Wiener's concept of functional teleology is too limited. Cybernetics emphasizes a mechanistic determinism. 6. Cybernetics functional teleology uses the analogy of the random machine and random selection. Open systems emphasize "active" determination. Wiener rejects the concept of final cause. 7. Cybernetics does not adequately explain novelty.

**Behaviorism and Process**

"Behaviorism" has several meanings. This study will use the term as it is defined by B. F. Skinner's
concept of operant conditioning. Operant conditioning is distinguished from stimulus-response (S-R) conditioning. Stimulus response conditioning can be an inherited reflex or a form of Pavlovian conditioning. Skinnerians equate all S-R and S-Q-R behaviors with reflex behavior. Skinner refers to S-R behavior as respondent conditioning because they are directly controlled by the stimulus. The stimulus is said to evoke or elicit the response. The temporal relation is reversed in operant conditioning. The operant behavior is emitted and then reinforced. In respondent conditioning it is the stimulus which appears first. In operant conditioning it is the behavior which appears first. In respondent behavior the environment alters the organism. In operant conditioning the organism alters the environment.

Operant behavior refers to those performances which are increased in frequency by operant reinforcement. Operant performances are to be contrasted with reflexes, when the environment elicits a change within the organism. . . . Operants act on the environment. These performances which change or operate on the environment are called operant behaviors . . . . The stimulus and response in operant and reflex (respondent) behavior function in opposite directions. The operant performance of an organism alters the environment. In a reflex, the environment alters the organism . . . . It is the fact that operant behavior alters the environment and is, in turn altered by its own effect on that environment which is of prime importance . . . . We speak of operant behavior as emitted. The main variable controlling the probability of the operant performance is the change in the environment produced by that performance. In operant behavior the primary
emphasis is on the stimulus which follows the performance in contrast to reflex behavior where the primary emphasis is on the stimulus which precedes the response and elicits or evokes it. For this reason, it is appropriate to speak to operant behavior as being emitted in contrast to reflex behavior which is elicited or evoked. Operant behavior is emitted, and it has the quality of purposiveness in contrast to the strictly reactive quality of the reflex.52

Skinner does not elicit behaviors; he waits for them to be emitted. When an emitted behavior is followed by a stimulus, it is reinforced. This may or may not increase the frequency of the behavior. But, the contingencies of reinforcement determine the behavior of the organism. Thus, behavior is a function of its consequences. The environment determines the consequences of the behavior. Behavior is contingent upon the environment; the environment controls behavior.

Behavior which operates upon the environment to produce consequences ("operant" behavior) can be studied by arranging environments in which specific consequences are contingent upon it. The contingencies under investigation have become steadily more complex, and one by one they are taking over the explanatory functions previously assigned to personalities, states of mind, feelings, traits of character, purposes, and intentions . . . . A Scientific analysis of behavior dispossesses autonomous man and turns the control he has been said to exert over to the environment.53

Skinner attempts to distinguish his analysis of causality from the cause-effect analysis of stimulus-response psychology. The important conclusion of the
following analysis is that Skinner's view of causality is based upon a functional teleology: S-R psychology is also based upon a functional teleology. Skinner distinguishes between respondent conditioning and operant conditioning. In respondent conditioning the stimulus, which controls the response, precedes the response. This analysis applies to both S-R and S-O-R theories. In operant conditioning the stimulus, which controls the response, follows the response. Both behavioral theories explain control in terms of a functional, cause-effect analysis of an external stimulus. The external environment is the designer. The behavioral explanation is a functional explanation of the relation between the environment and behavior. The concepts of internal control, autonomous man, novelty, creativity, and free choice are rejected.

A scientific analysis of behavior must, I believe, assume that a person's behavior is controlled by his genetic and environmental histories rather than by the person himself as an initiating, creative agent.

Skinner's basic goal is a "causal" analysis of behavior; but he understands cause basically as meaning efficient functional cause. He adopts the Newtonian concepts of prediction and control: he equates cause and function.
The extent to which we understand verbal behavior in a "causal" analysis is to be assessed from the extent to which we can predict the occurrence of specific instances and, eventually, from the extent to which we can produce or control such behavior by altering the conditions under which it occurs. What is lacking is a satisfactory causal or functional treatment.

Skinner also rejects other explanations based upon a creative teleology.

It is the general formulation which is wrong. We seek 'causes' of behavior which will have an acceptable scientific status and which, with luck, will be susceptible to measurement and manipulation. To say that these all 'all that is meant by' ideas or meanings is to misrepresent the traditional practice. We must find the functional relations which govern the verbal behavior to be explained; to call such relations "expression" or 'communication" is to run the danger of introducing extraneous and misleading properties and events. The only solution is to reject the traditional formulation of verbal behavior in terms of meaning.

Luthans echoes this functional emphasis:

The process of reducing complex behavior into these three elements of the contingency is termed functional analysis. Functional analysis attempts to systematically determine what cues are present when a specific response is emitted and, more importantly, what consequences are supporting that response.

The assumptions of Skinner, Luthans, and the behaviorists conflict with the process assumptions of Whitehead. The behaviorists reject a process explanation and advocate a structural-functional analysis.
The analogy is a mechanistic one. The present and future are determined by the past. The relation is a lawful relation, which can be studied like biology and physics study lawful relations - through scientific analysis.

We can follow the path taken by physics and biology by turning directly to the relation between behavior and the environment and neglecting supposed mediating states of mind. Physics did not advance by looking more closely at the jubilation of a failing body, or biology by looking at the nature of vital spirits, and we do not need to try to discover what personalities, states of mind, feelings, traits of character, plans, purposes, intentions, or the other prerequisites of autonomous man really are in order to get on with a scientific analysis of behavior.58

Skinner's position on cause and purpose is a complex grouping of positions. First Skinner maintains the need for functional causal explanations. He suggests that functional cause can be explained in terms of a functional purpose. The behavior occurs "in order to" fulfill some purpose. But, Skinner realizes he cannot use a cause-effect analysis. In fact he calls S-R theory a failure because it uses cause-effect analysis. But how does a theory explain function without a cause-effect analysis? Skinner must shift ground. He must modify the commonly understood concepts of "physics" which predict and control in terms of a functional cause-effect analysis.
Skinner stops using the assumptions of efficient functional cause and starts using an evolutionary theory of causality. Functional purpose is replaced by evolutionary purpose. Operant behavior is directed toward the "future."

Possibly no charge is more often leveled against behaviorism or a science of behavior than that it cannot deal with purpose of intention. A stimulus-response formula has no answer, but operant behavior is the very field of purpose and intention. By its nature it is directed toward the future: a person acts in order that something will happen and the order is temporal.\textsuperscript{59}

The final cause is defined by the evolutionary concepts of random selection and survival. Selection is equated with causality; environmental contingencies account for selection. The environment selects because of the organism's genetic history, i.e. evolution, and because of the organism's personal history, i.e. learning.

Nor does it mean (and this is the heart of the argument) that what are felt or introspectively observed are the causes of behavior. An organism behaves as it does because of its current structure, but most of this is out of reach of introspection. At the moment we must content ourselves, as the methodological behaviorist insists, with a person's genetic and environmental histories . . . . The environment made its first great contribution during the evolution of the species, but it exerts a different kind of effect during the lifetime of the individual, and the combination of the effects is the behavior we observe at any given time.\textsuperscript{50}
The environment creates a genetic history through evolution and natural selection. Skinner calls this contingency of survival, meaning that through the process of natural selection a genetic history is developed. Survival may be said to be contingent upon certain kinds of behavior. The environment selects a genetic history based upon contingencies of survival or selection by the process of evolution. The environment also selects the individual history based upon contingencies of reinforcement, or selection by the process of operant conditioning. Skinner chooses to call random or natural selection causality.

Darwin simply discovered the role of selection, a kind of causality very different from the push-pull mechanisms of science up to that time. The origin of a fantastic variety of living things could be explained by the contribution which novel features, possibly of random provenance, made to survival. There was little or nothing in physical or biological science that foreshadowed selection as a causal principle.61

Contingencies of survival and contingencies of reinforcement are both forms of causality and purpose for Skinner.

There are certain remarkable similarities between contingencies of survival and contingencies of reinforcement. Both exemplify, as I have noted, a kind of causality which was discovered very late
in the history of human thought. Both account for purpose by moving it after the fact, and both are relevant to the question of a creative design . . . . Evolutionary theory moved the purpose which seemed to be displayed by the human genetic endowment from antecedent design to subsequent selection by contingencies of survival. Operant theory moved the purpose which seemed to be displayed by human action from antecedent intention or plan to subsequent selection by contingencies of reinforcement. A person disposed to act because he has been reinforced for acting. . .62

Skinner calls natural selection a different kind of causal explanation. It is not the "push-pull" causality of S-R psychology, but rather causality based upon a probability statement and random selection. The environment controls behavior. If the environment is not purposely altered, then random selection or natural selection determine which contingencies will develop.

An individual can also learn behaviors based upon his individual conditioning history. Individual conditioning also selects behaviors from contingencies of reinforcement. An individual's environment includes his interpersonal environment, and cultural or social environment. Behavior is environmentally directed, not self caused (cause sui).

Intention and purpose refer to selective consequences, the effects of which can be formulated in "necessary laws." Has life, in all the forms in which it exists on the surface of the earth, a purpose, and is this evidence of intentional design?
The primate hand evolved in order that things might be more successfully manipulated, but its purpose is to be found not in a prior design but rather in the process of selection. Similarly, in operant conditioning the purpose of a skilled movement of the hand is to be found in the consequences which follow it.

Cause and purpose are determined by the past environment. The processes of evolution and natural selection lead to the development of a genetic history which determines behavior based upon selection by contingencies of survival. A second environmental history also determines behavior. Operant conditioning leads to the development of an individual history which determines behavior based upon selection by contingencies of reinforcemen. Many behaviorists would call this the "learning process," but Skinner rejects mentalistic terms such as learning and prefers to state that operant conditioning increases the probability of behaviors. Genetic history and individual history select, cause, or determine behavior; that is, Skinner adopts the view that the past determines all behavior.

In an important sense all behavior is inherited, since the organism that behaves is the product of natural selection. Operant conditioning is as much a part of the genetic endowment as digestion or gestation. . . . experimental analysis of behavior goes directly to the antecedent causes in the environment.
Skinner has a limited notion of cause and purpose, since he questions the possibility of free choice. All behavior is determined by environmental history—the past. According to Skinner, free will simply means there is a lack of an adequate functional, causal explanation. But, all things that come to be have causes, and the causes are past conditioning (the past). Hard-to-spot causes don't represent an absence of cause. Since the past explains all causes, there is no need for free will or free choice.

"Freedom' usually means the absence of restraint or coercion, but more comprehensively it means a lack of any prior determination: 'All things that come to be, except acts of will, have causes'. Operant behavior is called voluntary, but it is not really uncaused; the cause is simply harder to spot.

Skinner states that he has replaced the cause and effect analysis of Newton and S-R psychology with a causality of selection. But there is no real difference between Newton's efficient causality and Skinner's functional causality. The key question is what determines selection? The answer is past conditioning history, i.e. the external stimulus whether it precedes or follows the behavior. But, then Skinner faces Chomsky's question: How can novelty be explained?
The question expands into the larger question, how can we ever do anything we have not explicitly learned? In other words, how is creativity—whether in conversation, in art, in science, or in simple manual actions possible in a mere stimulus-response mechanism? 

Skinner's answer is that of chance, mutation, and accident as explained by the concept of natural or random selection.

The creative mind has never been without its problems, as the classical discussion in Plato's Meno suggests. It was an insoluble problem for stimulus-response psychology because if behavior were nothing but responses to stimuli, the stimuli might be novel but not the behavior. Operant conditioning solves the problem more or less as natural selection solved a similar problem in evolutionary theory. As accidental traits, arising from mutations, are selected by their contribution to survival, so accidental variations in behavior are selected by their reinforcing consequences.

Is each new word learned by "mutation"? Is each new sentence a result of chance? Does each new child learn language by random selection? Skinner would maintain that chance and past conditioning history are the only necessary and relevant explanations. Wiener, Bertalanffy and Mayr have all found problems with the concept of random selection as an explanation of cause or purpose. If randomness is the ultimate cause or purpose, then why doesn't behavior reflect the random, chaotic, disordered selection process? Selection by chance or probability would favor the more probable state which cybernetics calls entropy or disorder.
If randomness favors ordered states, what is the source of order? Skinner certainly has no explanation of the living organisms' tendency towards order. If random selection is an inadequate answer, behaviorists are left with the efficient causal explanation of Newtonian physics and S-R psychology. The past determines all that does and will happen. Skinner, himself, finds that answer inadequate.

Skinner's notion of evolutionary selection as an alternative causality is not unique. Evolutionary causality has been extensively analyzed by biologists and others. Bertalanffy shows that the assumptions of evolutionary causality (based upon natural selection and random mutation) are similar to the mechanistic functional causality of the Newtonian view.

In the world view called mechanistic, which was born of classical physics of the nineteenth century, the aimless play of the atoms, governed by the inexorable laws of causality, produced all phenomena in the world, inanimate, living, and mental. No room was left for any directiveness, order, or telos. The world of the organisms appeared a product of chance, accumulated by the senseless play of random mutations and selection; the mental world as a curious and rather inconsequential epi-phenomenon of material events.68

The evolutionary theory of random mutations and selection would predict a disordered, entropic system not a complex organization. Evolutionary selection assumes prior order; it does not account for the creative emergence of order.
Selection, i.e. favored survival of "better" precursors of life, already presupposes self-maintaining, complex, open systems which may compete; therefore selection cannot account for the origin of such systems.69

Thus, Ernst Mayr's statement that natural selection is definitely not a purposive explanation (c.f. 50). This statement is consistent with Wiener's statement that Ashby's unpurposeful random machine and Darwin's natural selection have the appearance of purposefulness in a system which is not purposeful.

Skinner's theory is not compatible with Whitehead's concept of process. Skinner's explanation adopts the framework of Newtonian physics and efficient functional causation. Skinner's goal is prediction and control. For Skinner, a scientific explanation is one which provides an adequate "causal or functional" treatment. It is an explanation of how the parts function in relation to each other - an explanation of "variables functioning."

Such Newtonian assumptions are incompatible with Whitehead's concept of process because:

1. Skinner gives a structural functional analysis based upon analysis of behavior and response. The "behavior" is a "permanent" thing that is caused by past conditioning history.

2. Skinner portrays an organism that is aimed at behaving according to his past conditioning, not order. If behaviors are not
determined by the past, they are a product of random chance or entropy, not order.

3. Skinner uses mechanistic explanations. Behaviors are caused by conditioning; they are not in the process of becoming. Skinner's universe moves towards chance and entropy, not order.

4. Skinner accepts the real world.

5. S-R respondent conditioning explains present behavior. Operant conditioning explains how the past determines the present and the future.

6. Skinner has no explanation based upon final cause.

7. Skinner's explanation of novelty is inadequate.

Selection, Process and Memory

Process is a complex interaction of events and causes. It is multi-variate and mutually causal; the meaning of mutual causality must extend beyond the concept of efficient cause.

The mechanistic explanation has been inadequate for biology and for the social and behavioral sciences. Newtonian physics is incapable of explaining highly
complex self-organizing systems. There is a general recognition that an alternative explanation is needed; thus, the almost universal acceptance of the "process" view in communication research.

A process view of memory and organizations would emphasize the process of becoming. Memory and organizations will be viewed as ordering processes. Each organism has an infinite number of past experiences. Memory is a process which brings order to that infinity of disordered experience. By ordering experience, memory allows the past to be a part of the process of bringing order to the "present." Memory, attention, and perception are all processes which bring order to an entropic universe. Organizations are also selective processes. By selecting, open systems create order and reduce entropy. Selective processes order by selecting; they determine by selection. These processes are the essence of creative dynamic teleology. The system's internal determination is a selective ordering of the universe. A system which selects is a system which is making choices. It is teleological and self-determinate, or self regulated, or causa sui. The system's ability to select is essential to its creativity.

Efficient functional cause sets boundaries or limits on what can happen in the universe. These limits determine
or regulate outcome to some extent. Efficient cause is the external world's or supra system's determination of the system. A genetic system carries a program which limits the direction and growth of the system it determines or causes certain actions. The program is determined by random selection; thus, random selection "causes" the genetic code. But, each or all of these explanations would lead to entropy and disorder. Yet, living, open systems are characterized by an increase in order. The creative teleology of the system determines outcome to some extent. Creative teleology is a form of *causa sui*. The system's own nature (internal constitution) determines its outcome. Creative teleology is an argument for explanations based upon a system's nature determining its outcome, in addition to efficient cause and genetic code. The complex whole determines its direction.

**Communication as Process**

Whitehead's concepts of process, final cause and *causa sui* leads to a specific formulation about the nature of organizational and memory processes. Organizations and memory are processes which are not understood as static structures but as dynamic processes continually "becoming." Karl Weick's definition of an organization defines organizations as processes. He states:
an organization can be defined in terms of processes of organizing. The central argument is that any organization is the way it runs through the processes of organizing. These processes which consist of interlocked behaviors, are related and form a system. . . . organization is fluid, continually changing, continually in need of reaccomplishment, and it appears to be an entity only when this fluidity is 'frozen' at some moment in time.70

The process orientation rejects the Newtonian concept of static structure going through a cause-effect sequence of structural changes. Katz and Kahn indicate the importance of conceiving structure as process (not static objects).

. . . the structure is to be found in an interrelated act which returns upon themselves to complete and renew a cycle of activities. It is events rather than things which are structured, so that social structure is a dynamic rather than a static concept. Activities are structured so that they comprise a unity in their combination or closure. A simple linear stimulus-response exchange between two people would not constitute social structure. To create structure, the responses of A would have to elicit B's reactions in such a manner that the responses of the latter would stimulate A to further responses. Of course the chain of events may involve many people, but their behavior can be characterized as showing structure only when there is some closure to the chain by a return to its point of origin with the probability that the chain of events will then be repeated.71

The events that constitute the organization are behavioral events. Interlocked behaviors are the events
of organizing. The repetition of cycles of interlocked behaviors are the "structure" of an organization. Weick elaborates on this idea by referring to Alport's (1962) concept of collective structure.

Having first converged on shared ideas of how a structure can form, the persons then activate a repetitive cycle of interlocked behaviors—that is, they form a collective structure. The range of their behaviors narrows before a group forms, not after; the group is made possible by this narrowing and convergence.72

The key to understanding the structure of the organization is understanding patterns of behavior. The analysis of organizations is based upon the process of behavioral interaction and how it is patterned over time. The unit of analysis is not people or elements of physical structure. The unit of analysis is the interlocked behavioral patterns and how they change over time.

Creating Order

Bertalaffny's concept of equifinality accounts for the increase in order in open or "living" systems. Equifinality is directed towards the increase in order, which characterizes open systems. The process of ordering is the essence of an open system. The system is creatively teleologically dynamic. It determines its own outcome to some extent. The open system has choice. It selects and determines or causes its own creative teleological direction.
An organization is the process of creating order from disorder. An organization causes or determines order by choosing or selecting. The selection process reduces entropy (it removes equivocality) and increases order. The process of organizing is a process of selecting. The choices or selections made by the organizing processes determine which events will become; the organizing process is teleologically dynamic. It moves towards order. The direction of movement is determined or caused by the selection process. The selection process is a result of the communication behavior within the organization. To understand organizations, we must understand how they change over time. Understanding static structures or linear causal chains does not give an adequate description of an entity which is better understood as an ever changing process. The key elements in organizations are the human behaviors, comprising the process of organization. Katz and Kahn concur when they state:

In this sense, communication, the exchange of information and the transmission of meaning is the very essence of a social system or an organization. The input of physical energy is dependent upon information about it, and the input of human energy is made possible through communicative acts. Similarly the transformation of energy (the accomplishment of work) depends upon communication between people in each organizational subsystem and upon communication between subsystems.
But the whole is more than the sum of its parts.

The interactive behaviors form a pattern of organizational decision making which constitutes the organization's enacted environment.

Instead of discussing the 'external environment,' we will discuss the 'enacted environment.' The phrase 'enacted environment' preserves the crucial distinctions that we wish to make, the most important being that the human creates the environment to which the system then adapts. The human actor does not react to an environment, he enacts it. It is this enacted environment, and nothing else, that is worked upon the processes of organizing.74

The concept of enacted environment also describes the cognitive processes of attention and selection.

Given this concept of time, several properties of an enacted environment now become apparent. First, the creation of meaning is an attentional process, but it is attention to that which has already occurred. Second, since the attention is directed backward from a specific point in time (a specific here and now), whatever is occurring at the moment will influence what the person discovers when he glances backward. A complete formulation of meaning that preserves these features is 'here, now, and thus.' Attention is directed backward from a given point in time (here and now), and whatever past experiences it fixes on are the meaningful objects (thus). Third, the quotation from Schutz makes it apparent that memory processes, whether they be retention or reconstruction, influence meaning. Fourth, we can now see why it is that only when a response occurs does the stimulus become defined. The reason is that we cannot know the beginning phase. An action can become an object of attention only after it has occurred. While it is occurring, it can not be noticed.
Note, in addition, that the meaning of the actions is determined by the projected act as a whole (Schutz refers to this as the project). What this means is that the actor visualizes the completed act, not the component actions that will bring about completion. It is only when the realization of this future act is imagined that it is possible for means to be selected.  

The memory process is an inherent part of purposiveness and attention.

This reasserts the argument that the environment is a phenomenon tied to processes of attention, and that unless something is attended to it doesn't exist.

The selection process can choose to eliminate information, retain information, or create information. These choices result in an ordered universe, and the characteristics of the system are defined by its choices or selective acts.

Selection is accomplished by interlocked behavioral patterns. Interlocked behavioral patterns are what we call communication. Interlocked behavioral patterns in the organizational process are called organizational communication. Selections that are made in the past, but which are reintroduced in the present are memory. Interlocked behaviors which result in the reintroduction of past ordering decisions are organizational memory processes.

Memory is the process in which selections are made to reintroduce selection or ordering patterns of the past.
Memory is constituted by a series of behavioral events. It is thus a process; it can be characterized as a communication process within the organization. In an organization, memory is a form of the organizational communication process. Interlocked behaviors result in choices or selections of what is to be reintroduced from the past.

Memory, therefore, is a form of ordering. It orders the world for the organization by introducing a selection pattern from the past.

Selection implies an active process. What is the active element? It is the organization. The organization is teleologically dynamic. It is self aiming. The selection process does not require consciousness. It does not require a human component. Non-conscious open systems still are capable of creating order.

**Distinction Between Isomorphic and Anthromorphic Process.** An organization behaves as a living organism or self-regulating system. It performs many of the same functions using similar processes. We can refer to cognitive processes in organizations, but that does not mean an organization possesses a physical brain. It simply means it shares processes isomorphically with the cognitive process of the individual. Katz and Kahn (1966) give an effective explanation of this distinction.
Our discussion of the common characteristics of all open systems should not blind us to the differences that do exist between biological and social systems.

Biological structures have a physical boundedness that social structures lack. The biological structures are anchored in physical and physiological constancies, whereas the social structures are not.

Social structures are of course not found in a physical vacuum. They are tied into a concrete world of human beings, material resources, physical plant, and other artifacts, but these elements are not in any natural interaction with each other. In fact, the social system has considerable independence of any particular physical part and can shed it or replace it. The communication network of a social organization bears only a distant and figurative resemblance to the physical structures, such as the circulatory and nervous systems, by which the subparts of a biological organism are integrated. Too often, such loose metaphors have prevented the sociologists from grasping the essential differences between organism and society.

A social system is a structuring of events or happenings rather than of physical parts and it therefore has no structure apart from its functioning (Allport, 1962). When a social system ceases to function, there is no longer an identifiable structure. It is difficult for us to view social systems as structures of events because of our needs for more concrete and simple ways of conceptualizing the world. Hence we identify the buildings, the technological equipment, and the people they contain as the structure of an organization.

There has been no more pervasive, persistent, and futile fallacy handicapping the social sciences than the use of the physical model for the understandings of social structures.

If social organizations are given attributes of anatomical structure then the emphasis on process is lost. Vitalism becomes a logical consequence of such a misinterpretation.
The analogy between human cognitive models and the organization must be based upon an isomorphism of process.

Conclusions

The concepts and finality of cause have been used as a framework for evaluating the three theoretical formulations introduced in this chapter. The concept of cause used by each theory leads to fundamental assumptions about the world, and it distinguishes between the assumptions of each theory. Whitehead's definition of process assumes that there is a final cause which orders the universe. The "process of becoming" is a "movement" towards order. The process is determined by efficient cause in part and is self-determined in part. Final cause allows for self-determination. Cause has been called the thing which "determines" the outcome. A completely deterministic universe leaves no place for alternative outcomes. In classical mechanics there is no choice, no alternative. Creative teleology introduces alternative outcomes. Each alternative, which is consistent with the possible, has a potential for "becoming". The "choice maker" determines which alternative will be chosen. In that sense the choice maker "causes" or determines the alternative. Choice can also be called selecting between alternatives; thus it is a selection process. A "choice maker" selects among
alternatives, and the basis of the choice introduces teleology. The basis of a choice represents a reason or a purpose for choosing. Choice establishes a direction or an aiming at a goal on the basis of which a choice is made. Creative teleologists are introducing the concept of "self" determination. Creative teleology introduces choice and alternatives. Alternatives can be represented statistically as probability or potentiality.

Selection assumes a reason or basis for selecting. Explanations based on selection are theories of "the reason why" (cause) a selection was made. Choice, selection and purpose are not limited to human behaviors. Organizations also "select". They have alternative pathways. Many reasons are given as the basis of selection. These reasons indicate theoretical assumptions. Whitehead explains cause in terms of efficient cause, and subjective final cause. Whitehead's process makes choices that aim towards order. Bertalanffy adopts a creative teleological explanation of finality. The nature of the system is self-determined. The system's characteristics serve as a teleological aim that result in higher levels of order. Wiener adopts a functional teleological theory which assumes the system moves towards disorder. Determination of the system is a mechanistic determination. Skinner uses
the evolutionary concept of natural selection to explain selection by chance, but is that selection? It does not represent purposeful choice. Skinner explains behavior as being determined by the past. Creative teleological explanations introduce a "choice maker" into causal explanations. Whitehead says that "process" involves choice. Wiener introduces a controller which is in turn controlled by initial or past conditions. Skinner says behavior is determined by the past. Whitehead's and Bertalanffy's views are consistent with a creative process framework. Skinner's and Wiener's are more consistent with a functional mechanistic formulation. Whitehead and Bertalanffy conceive of a universe of order. Skinner and Wiener conceive of a universe of entropy, chance and randomness.
NOTES


3. Ibid., p. 27.

4. Ibid., p. 320.

5. Ibid., p. 34, 35.

6. Ibid., pp. viii, ix, 43.


8. Ibid., p. 497.


12. Ibid., pp. 15, 21, 22.

13. Ibid., p. 33.


17. Ibid., pp. 36, 37.

18. Ibid., p. 321.


21. Ibid., p. 47.

22. Ibid., p. 50.
23 Ibid., pp. 53, 54.
25 Ibid., p. 131.
26 Ibid., p. 365.
28 Ibid., p. 157.
30 Ibid., pp. 75, 76.
31 Ibid., pp. 76, 77.
32 Ibid., p. 77.
33 Ibid., pp. 77, 78, 79.
34 Ibid., p. 159.
35 Ibid., p. 44.
36 Ibid., p. 47.
37 Ibid., p. 55.
39 Ibid., pp. 33, 34.
40 Ibid., p. 33.
43 Wiener, op. cit., p. 37.
44 Lerner, op. cit., p. 42.
45 Wiener, op. cit., pp. 37, 38.
46 Buckley, op. cit., p. 225.
48 Ibid., pp. 207, 208, 209.
49 Bertalanffy, op. cit., p. 17, 163.
50 Ibid., pp. 150, 161, 162, 163.
51 Ibid., p. 150.
56 Ibid., p. 10.
60 Ibid., p. 17.
61 Ibid., p. 36.
62 Ibid., pp. 40, 244.
64 Skinner, About Behaviorism, op. cit., pp. 30, 43, 44.
65 Ibid., p. 54.


68. Bertalanffy, op. cit., p. 45.


70. Weick, op. cit., pp. 90, 91.


72. Weick, op. cit., p. 44.


74. Weick, op. cit., p. 64.


CHAPTER III
ORGANIZATIONAL COMMUNICATION

A description of the operative memory in organizational communication requires an analysis of organizational theory. Whitehead’s definition of process has been adopted. Through an analysis of causality and teleology, Chapter II has established a framework to define process and to distinguish between theoretical definitions of process. Skinnerian behaviorism, cybernetics, and general system theory all have different definitions of process. These different definitions result in divergent views of organizations, communication, and memory.

Chapter III contrasts the three theoretical perspectives of organizational communication which emerge from the distinct theoretical assumptions. Chapter III develops the Skinnerian behaviorist, cybernetic, and general system explanations of organizations and communication. It is impossible to present one definition of organizational communication which would be consistent with all three theories. Each theory has a distinct explanation of organizations.
A Skinnerian Behaviorist Theory of Organizational Communication

Operant conditioning is the key concept which distinguishes Skinnerian behaviorism from other behaviorists. The concept of operant conditioning creates a unique organizational theory: a behavioral theory, defined within an organizational environment, not a theory of organizations. The behavioral theory is the same behavioral theory in all environments. Behavioral theory of the pigeon in the Skinner box, or verbal behavior, or group behavior, or organizational behavior all represent one theory of behavior. Organizational behavior is explained by using the operant explanation applied specifically to the environmental setting of the organization.

Skinner is an expert in operant theory, but he does not consider himself an expert in organizational settings.

I'm not a specialist in industrial psychology.... Behavior modification is beginning to get into industry and that may mean a change.... It is possible that we're going to see an entirely different kind of psychology in industry. Unfortunately, there are not yet many people who understand the principle. It is not something that can be taken over by the nonprofessional to use as a rule of thumb. It requires specific analysis and redesign of a situation. In the not-too-distant future, however, a new breed of industrial manager may be able to apply the principles of operant conditioning effectively.

But, as Skinner indicates there is a growing interest in applying operant principles to organizational behavior.
Fred Luthans, one of the leading proponents of the behavioral approach in organizational settings, emphasizes the application of behavioral control techniques based upon operant theory. The techniques are often called behavior modification (or B. Mod.). Luthans extended behavioral modification to the organization and created the term organizational behavior modification (or O. B. Mod.).

**Operant Behavior.** The "operant theory" of organizations is based upon several concepts. Many have already been explained in Chapter II: S-R respondent behavior, operant conditioning, reinforcement history, genetic history, evolution, natural selection, and functional explanations. These concepts are also used by Luthans to explain organizational behavior. The behaviorist equates organizational behavior and behavior. The organization does represent a specific environmental setting which can benefit from scientific analysis. A precise definition of the organizational setting will help explain behavior, but it will not change the basic explanation of all behavior as given by operant conditioning.

**Behavior is a function of its consequences.** When the consequences of the behavior increase the frequency of the performance, reinforcement has occurred. The increased frequency is given as a statistical probability. Following the behavior with a rewarding stimulus results in an
increase in frequency and is called positive reinforcement. Following the behavior by removing an aversive stimulus results in an increase in frequency and is called negative reinforcement. Following the behavior with an aversive stimulus may decrease the performance and is called punishment. The stimuli which follow an emitted behavior cause or determine the frequency of performance.

Behavioral Engineering. Behavioral change is accomplished by "scientific" experimentation and behavioral engineering.

What we need is a technology of behavior.... Designing a culture is like designing an experiment; contingencies are arranged and effects noted.... this is an important engineering problem.

The behaviorist offers a prescriptive technology for change:

After reading about the principles, procedures, and techniques of behavior modification, the reader has hopefully gained an appreciation of the technology of learned behavior. It has special language, its own body of theoretical and empirical knowledge, and a sophisticated collection of interrelated procedures and techniques capable of application to human resource management.

Behavior is controlled by engineering the environment through the use of the techniques of behavioral modification.

Skinnerian behaviorism and its operant conditioning paradigm, meanwhile, has been widely applied in an approach commonly referred to as applied behavior analysis. It is carried on in natural, real-life
settings. The emphasis is upon changing behavior through the management of consequences. Most of the specific behavioral change techniques presented as O.B. Mod. could effectively fall under applied behavior analysis.

Specifically, behavior modification (popularly known as B. Mod.) is the practical application of Skinnerian operant conditioning and related techniques....The most significant point of departure for O.B. Mod. is the Skinnerian assumption, based upon many years of empirical research, that organizational behavior is a function of its consequences.

An External Approach

Luthans follows Skinner in attacking internal, mentalistic explanations of behavior.

One approach, which could be called the internal approach, explains behavior in terms of mental states and cognitive processes. In this explanation, the internal states cause behavior. The other approach, which could be called the external approach, explains behavior in terms of environmental consequences. (The internal approach is primarily a 'motivational' explanation of human behavior and the external approach is mainly a 'learning' explanation.) Thus, the external approach, which does not deal with unobservable inner states, is much more adaptable to scientific explanation than the internal approach. However, management has almost totally ignored the external explanation of organizational behavior, even though one of the hallmachers of a scientific perspective is to deal with observables....The principal goals of science are to understand, predict, and control the phenomena in question. Reliance upon the internal model has definitely contributed to the understanding of organizational behavior but has generally failed to help predict and control it. When one considers that the very essence of human resource management is to predict and control the attainment of organizational objectives, the importance of looking toward an alternate model becomes clear....In the external approach, observable behavior in organizations, and its consequences, is the key. This external or environmental model of organizational behavior is based primarily on the pioneering work of B.F.
Skinner. Among Skinner's vast number of contributions, his distinction between respondent (unlearned) and operant (learned) behavior is the most important. On the basis of scientific research, he concluded that operant behavior is a function of its consequences.... Virtually all organizational behavior is learned.5

Behaviorists prefer the explanation of operant conditioning because: they say it is scientific, it explains "lawful" relations, and it can lead to prediction and control, not "mere understanding."

Learning. One way a psychologist describes predicting and controlling behavior is learning theory. Learning theory usually represents a theory about why a change in behavior takes place. Luthans mentions three important theories: cognitive theory, S-R theory, and operant theory. The internal approach or cognitive learning theories explain the acquisition of knowledge, but not necessarily behavior, through perception, thinking, judgment, and reason. The external approach or behavioral learning theories deal only with behavioral change, not cognitive, unobservable, knowledge acquisition. The behavior learning theorists or behaviorists first make a careful distinction between respondent (reflexive, unlearned) behavior and operant (voluntary, learned) behavior. By definition, operant behavior is of major concern in learning.6

Not only do Skinnerian behaviorists reject cognitive theories of learning, but they also reject S-R theories of learning. Skinner classifies S-R behavior as respondent behavior. Luthans defines learning as operant behavior; therefore, respondent and S-R behavior are by definition unlearned behaviors.
This behavior which operates on and changes the environment is what learning is all about. Thus, learning is defined and used in this book (Organizational Behavior Modification) as any change in behavior that results in a change in the environment.7

The definition of S-R behavior as unlearned behavior represents a distinct break from psychologists who define S-R behavior as learned behavior. Pavlov, Watson, Thorndike, Hull, and Neal Miller are all in conflict with Skinner on this point. The S-R psychologist portrays the stimulus as the cause of the response. The environment causes the response. In contrast, Skinner states the behavior (or response) operates on the environment.

Contingencies are specific formulations of the interaction between an organism's operant behavior and its environment (Skinner, 1969, p. 7). A contingent relationship could be simply thought of as an if-then relationship. Learned behavior operates on the environment to produce a change in the environment. Therefore, if the behavior causes the environmental change, then the environmental change can be said to be contingent upon the behavior. In other words, the specific environmental change only comes when the behavior has been emitted. The Skinnerian concept of contingency involves three major elements: (1) a prior environmental state or cue; (2) a behavior; and (3) a consequence.8

Skinner rejects the C-E analysis inherent in S-R psychology.

...behaviorism is so often said to treat behavior simply as response to stimulus. If that were the case, an organism would have much of the character of a puppet, robot, or machine. But stimuli do not elicit operant responses; they simply modify the probability that responses will be emitted. They do so because of the contingencies of reinforcement.
Skinner also rejects mechanistic explanations based upon C-E and S-r reasoning. But, his own formulation is basically mechanistic. Skinner replaces the S-R, C-E, push-pull machine with a random selection process (like the cybernetic random mechanism) which replaces C-E with probability.

Yet, the mechanistic assumption of the past determining the present is retained by Skinner.

In a behavioral analysis a person is an organism, a member of the human species, which has acquired a repertoire of behavior. The person who asserts his freedom by saying, I determine what I shall do next, is speaking of freedom in or from a current situation: the I who thus seems to have an option is the product of a history from which it is not free and which in fact determines what it will now do. A person is not an originating agent; he is a locus, a point at which many genetic and environmental conditions come together in a joint effect.

The essence of Skinner's behavioral explanation is that behavior is a result of conditioning history. Behavior is lawful because it is fully determined by conditioning history. Given an adequate explanation of conditioning history and present environmental conditions, behavior can be predicted and controlled. Man is an animal subject to the "laws" of behavior. Man is a complex machine—but a machine.

Man is not made into a machine by analyzing his behavior in mechanical terms. Early theories of behavior, as we have seen, represented man as a push-pull automaton, close to the nineteenth-century notion of a machine, but progress has been
made. Man is machine in the sense that he is a complex system behaving in lawful ways, but the complexity...is extraordinary.1

Since cybernetics is based upon a S-R learning theory, it is possible to see why Skinner is so opposed to cybernetic and information theory.

The opposing view—common, I believe, to all versions of behaviorism—is that the initiating action is taken by the environment rather than by the perceiver. The reflex was a conspicuous example, and a stimulus-response version of behaviorism kept to the same pattern, as did information theory and some computer models. A part of the environment entered the body, was transformed there, perhaps was stored, and eventually emerged as a response. Curiously enough, this differed from the mentalistic picture only with respect to the initiator of action. In both theories the environment penetrated the body: in the mentalistic view, it was taken in by the perceiver; in the stimulus-response view, it battered its way in...Both formulations directed attention to the inner representation of reality in its various transformations. A basic question could be put this way: What becomes of the stimulus?

In an operant analysis, and in the radical behaviorism built upon it, the environment stays where it is and where it has always been—outside the body. The stimulus-response model was never very convincing, however, and it did not solve the basic problem, because something like an inner man had to be invented to convert a stimulus into a response. Information theory ran into the same problem when an inner 'processor' had to be invented to convert input into output.12

Organizational Behavior Modification. Organizational behavior modification applies behavioral theory to an organizational setting. Luthans urges the manager to act as a "behavioral scientist." The organization is described in behavioral terms. Virtually all organizational behavior
is operant behavior (as opposed to reflex or respondent behavior). Luthans describes the manager as a manager of behavior:

Organizational consequences are simply changes in the environment caused by organizational behavior.... A major task for the contingency manager is to identify performance-related behavior in employees' behavior repertoires. Also, it is important to identify behavior which threatens to restrict performance and behavior which has no impact on performance. Finally, it is vital to successful human resource management to have the employees learn the behavior not currently part of their repertoire that leads to effective performance.13

Behavioral theory must describe a specific set of contingencies. Each situation and each set of contingencies is unique.

Because people and organizational situations are so different, it would be virtually impossible to formulate one specific O.B. Mod. strategy with universal applicability. Consistent with a general contingency theory of management (Luthans, 1973b), specific human resource management concepts and techniques should only be applied contingent upon the situational conditions.14

Therefore, a basic O.B. Mod. model is applied within unique organizational settings.

The authors (Luthans and Kreitner, 1974) have formulated a general O.B. Mod. problem-solving model, called behavioral contingency management or BCM. The model provides a general methodology for identifying and contingently managing the critical performance-related behaviors of employees in all types of organizations.... Very simply, BCM can be summarized by five one-word steps: (1) identify; (2) measure; (3) analyze; (4) intervene, and (5) evaluate.15

The five steps are all related to behavior modification theory. Step one involves identifying behavioral
events. Step two is the measurement of the frequency of response. Step three involves analysis of present reinforcement contingencies. Step four, implementation of intervention strategies, includes reformulation of reinforcement contingencies by using the basic strategies of positive and negative reinforcement, punishment, extinction, or a combination of these. Step five involves evaluating the effectiveness of contingency management through behavioral theory. The theory is prescriptive; it involves applying "behavioral modification technology" to organizations. It is similar to other "behavioral engineering" attempts.

Behaviorists argue for a scientific analysis. The behaviorists attack traditional theories because they feel that traditional theories fail to predict and control. Behaviorists argue for a functional analysis as they perceive such an analysis leads to prediction and control.

The Problem of Complexity

But, an analysis of the behavioral theory illustrates it is open to the same charges that behaviorists apply to "non-scientific" explanations. The behaviorists are fond of using case studies which deal with physical tasks; tasks involving people and things. They rarely deal with tasks involving people working with people. The case studies do not often consist of complex verbal, interpersonal
or social behavior:

Naturally, as one proceeds up the organizational hierarchy, from relatively simple and repetitious tasks to more complex executive-level problem solving and decision making, the identification of performance-related behavioral events becomes more difficult. However, this is not to say that the identification becomes impossible....

All scientific endeavor, including building a science of human behavior, must start off with relatively simple subjects and then move toward the more complex. For example, as Skinner (1969) noted: 'Those who study living organisms--say, in genetics, embryology, or medicine--usually start below the human level, and students of behavior have quite naturally followed the same practice.'

Behavioral theory offers no better prediction and control of complex behaviors than traditional theories. But their answer is: it might be difficult, but it is not impossible. This answer is equally applicable to the behavioral attack of cognitive explanations:

Those who mistakenly see O.B. Mod. as impractical and little more than a 'string-pulling' process point out that there are simply too many strings to pull in a complex organizational setting....

We answer this argument by returning to the behaviorist's basic premise--behavior is a function of its consequences. This law holds regardless of the simplicity or complexity of the surrounding environment. The fact that an environment happens to be a complex modern organization does not justify disregarding the rules for predicting and controlling behavior. There is no question that it is easier to manage environmental contingencies and thus control behaviors in relatively uncomplicated and well-controlled environments, but this reality should not automatically preclude an O.B. Mod. approach in more complex settings. This is a challenge rather than an impossibility.'
How does Luthans deal with complex organizational behavior? Luthans' qualifications give a clear example. He seems to abandon Skinner and starts referring to variables that he and Skinner have rejected:

...When attention shifts to the development of appropriate intervention strategies, certain variables within the work environment should be considered. The structure of the organization is one such variable....Internal organizational processes such as decision making, communication, and control are also variables (Luthans, 1973a). These processes may individually or collectively contribute to the eventual success or failure of a particular contingency management strategy....The complicating nature of groups with all of their force and influence on organizational behavior, can not and should not be under-estimated in BCM. Yet, the problems associated with groups are certainly not insurmountable.

A final major environmental variable is the nature of the task. Some tasks lend themselves to behavioral interventions and some do not. Group process, communication, and decision making are all examples of cognitive, self-directed behavior. It seems inconsistent to refer to such an analysis for complex behavior, and yet contend that behavioral theory replaces such concepts.

Self-Control. Luthans also gives an interesting explanation of self-control, a concept he regards as essential to explaining organizational behavior:

Self-control typically involves selecting one set of consequences from two or more alternatives. It involves careful consideration of the consequences of one's own alternative behavior. Most often the person using self-control will choose behavior which leads to desirable consequences rather than
behavior of a rash, impulsive, and indecisive nature that leads to undesirable consequences. This explanation appears to be deceptive. It indicates there is a distinction between environmental control and self-control. It indicates that an individual selects. But, how are these selections determined? Contingencies in the environment and past conditioning determine the selections. The behaviorist denies that the mind or the individual has any role in the selection. By definition self-controlled behavior is not distinct from non-self-controlled since both are a result of past environmental consequences. Luthans' use of the concept of self-control illustrates the need for inner determination in complex behavior (compare Skinner's position in footnote 10 with Luthans' interpretation in footnote 19).

Skinner has rejected earlier explanations of behavior as being inadequate. They do not explain enough or lead to prediction and control. Skinner advocates the rejection of freedom or self-determination, since he sees man as completely determined as an apple falling from a tree.

This escape route is slowly closed as new evidences of the predictability of human behavior are discovered. Personal exemption from a complete determinism is revoked as a scientific analysis progresses, particularly in the accounting for the behavior of the individual.
Yet, Skinner admits that his science doesn't have the answers he demanded of the earlier theories.

The interpretation of the complex world of human affairs in terms of an experimental analysis is no doubt often oversimplified. Claims have been exaggerated and limitations neglected. But the really great over-simplification is the traditional appeal to states of mind, feelings, and other aspects of the autonomous man which a behavioral analysis is replacing.

A science of behavior is not yet ready to solve all our problems, but it is a science in progress, and its ultimate adequacy cannot now be judged. When critics assert that it cannot account for this or that aspect of human behavior, they usually imply that it will never be able to do so, but the analysis continues to develop and is in fact much further advanced than its critics usually realize.

Skinner accepts his failure to explain complex behavior, but he has higher demands for cognitive explanations.

Self-control, or self-management, is a special kind of problem solving which, like self-knowledge, raises all the issues associated with privacy....It is always the environment which builds the behavior with which problems are solved, even when the problems are to be found in the private world inside the skin. None of this has been investigated in a very productive way, but the inadequacy of our analysis is no reason to fall back on a miracle-working mind. If our understanding of contingencies of reinforcement is not yet sufficient to explain all kinds of thinking, we must remember that the appeal to mind explains nothing at all.

Skinner uses an evolutionary analogy to replace a cause-effect analogy. Yet, this hardly leads to the prediction and control Skinner has demanded of other theories.

...No one could have predicted the evolution of the human species at any point in its early history, and the direction of intentional genetic design will depend upon the evolution of a culture which is itself unpredictable for similar reasons.
It is hardly surprising that Skinner's explanation fails to explain complex behaviors. The mechanistic assumptions of behaviorism are not suited to explanations of complex processes.

**An Evaluation of Behavioral Theory**

The behavioral analysis of organizations is of limited usefulness in the development of a final model of the retention process in organizational communication. The basic behavioral assumption is that past and present conditioning determine behavioral acts. The assumption of past conditioning is not compatible with Whitehead's theory of process. Behaviorism denies Whitehead's notion of *caus sui* or self determination. Skinner posits a theory of past conditioning based upon the mechanistic concept of functional teleology. Skinner accepts probabilistic predictions, but he bases them upon deterministic past conditioning. The mechanistic explanation of process based upon deterministic past conditioning resembles Whitehead's concept of efficient cause. Skinner rejects the concept of final cause or determination based upon the internal subjective world of the entity. Chomsky's basic criticism of Skinner is his failure to explain novelty and creativity. Chomsky's criticism is consistent with Whitehead's analysis of self determination or self cause. Skinner's analysis is a functional analysis; it is not consistent
with Whitehead's analysis of process. Skinner's analysis is concerned with objective immortality, the determinate actuality of concrescence, and not the dynamic process of becoming.

Skinner does offer a comprehensive behavioral theory covering one of Whitehead's domains of concrescence. Skinner's analysis offers a valuable explanation of determinate actuality. But, the denial of the internal determination and indeterminate process makes Skinner's analysis an inadequate explanation of process. The behavioral explanation of organizations is not consistent with the assumption that the process of organizing is the defining property.

A Cybernetic Theory of Organizational Communication

Wiener calls cybernetics the science of communication and control. Cybernetics has tried to develop a general theory of control which describes all communication and control systems. Several cybernetic concepts have already been introduced in Chapter II including the Second Law of Thermodynamics, all closed systems tend toward increased entropy. All closed systems move from a state of organization to a state of chaos and disorganization. Cybernetics deters increased entropy by introducing information. Information is defined as negative entropy, and thus information counteracts entropy. Shannon uses
information in a very special sense; his usage should not be confused with its ordinary usage:

In particular, information must not be confused with meaning....That is, information is a measure of one's freedom of choice when one selects a message....The concept of information applies not to the individual message (as the concept of meaning would), but rather to the situation as a whole, the unit information indicating that in this situation one has an amount of freedom of choice, in selecting a message, which it is convenient to regard as a standard or unit amount.24

Cybernetic systems establish control through the feedback process. Cybernetic systems are called learning systems. Learning is explained by the circular causality of the negative feedback loop. Since the controller must retain the expected output in order to compare it to the actual output, memory is essential to cybernetic theory. The stored expected output can also be represented as a plan or a program for directing the system towards its purpose.

A Restricted Definition of Teleology.

Weiner's interpretation of purpose leads to a restricted definition of teleology which is different from Bertalanffy's definition. Wiener's definition rejects the concept of cause and final cause:

We have restricted the connotation of teleological behavior by applying this designation only to purposeful reactions which are controlled by the error of the reaction--i.e., by the difference between the state of the behaving object at any time and the final state interpreted as the purpose.
Teleological behavior thus becomes synonymous with behavior controlled by negative feedback, and gains therefore in precision by a sufficiently restricted connotation.

Wiener gives a definition of teleology based upon the error adjustment of the negative feedback loop.

Steady states in all living systems are controlled by negative feedbacks. A living system is self-regulating because in it input not only affects output, but output often adjusts input. The result is that the system adapts homeostatically to its environment.

The cybernetic definition of purpose is behavioral and functional. S-R learning theory is the basis of cybernetic behavioral theory. Cybernetics adopts a stimulus-response theory of learning in contrast with Skinner's operant conditioning. One of the critical assumptions of cybernetic theory is S-R psychology, since it is used as an explanation of "self-regulating" systems. Changes in the system's behavior are explained by learning or the genetic programs developed by evolution.

Since organizations can be viewed as systems, organizational theory can be based upon the cybernetic model. In fact, several theorists have accepted the assumptions of cybernetic theory: Simon, Deutsch, Beer, Kelley, Wiener, Ashby, George A. Miller, and James G. Miller are examples.

Living Systems. In his text, Living Systems, James G. Miller gives a comprehensive statement of organizational
cybernetic theory. Miller develops "general living systems theory" as a theory of all "living systems." He uses the term "living" in its cybernetic form. Complex structures which carry out living processes are considered living systems. There are seven hierarchical levels—cells, organ, organism, group, organization, society, and supranational system. Miller identifies 19 critical subsystems, in Figure 2, whose processes are essential to life.

Since organizations are living systems, Miller calls these 19 subsystems critical processes for organizational viability. These 19 processes are what constitute the living system known as an organization.

My central thesis is that systems at all these levels are open systems composed of subsystems which process inputs, throughputs, and outputs of various forms of matter, energy, and information. I identify 19 critical subsystems whose processes are essential for life, some of which process matter or energy, some of which process information, and some of which process all three. Together they make up a living system.27

Miller's application of general system theory and open system theory should be distinguished from Bertalanffy's use of these terms. Miller applies the terms within a frame of reference which is not compatible with Bertalanffy. In an earlier paper, Miller (1970) clearly states the foundation of his theoretical assumptions:

This analysis of living systems uses concepts of thermodynamics, information theory, cybernetics,
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Figure 2. 19 Critical Subsystems: Miller.
and systems engineering, as well as the classical concepts appropriate to each level.29

His model is primarily a cybernetic and information-theory model. The cybernetic assumptions are clearly demonstrated in Miller's analysis of the three most important subsystems; the associator, memory, and the decider. The assumptions Miller uses in his analysis of these subsystems are not compatible with the assumptions of Bertalanffy or Whitehead. Miller has incorporated some open system concepts. His theory represents an extension of cybernetic theory. Yet, Miller's assumptions are firmly established in cybernetic theory.

**Structure, Function, and Process.** The functional analysis of cybernetics is fundamentally deterministic. The past is used to explain the present as well as to predict the future. Whitehead's notion of process is more consistent with Bertalanffy's notion of equifinality or creative teleology. Wiener rejects teleology based upon a "final cause." He seems to reject the concepts of equifinality and creative teleology. Wiener's theory of cybernetics adopts the deterministic notion of equilibrium.

Ashby's introduction to cybernetics gives a clear indication of the deterministic assumption:

Even whether the system is closed to energy or open is often irrelevant; what is important is the extent to which the system is subject to determining and controlling factors. So no information or
signal or determining factor may pass from part to part without its being recorded as a significant event... We are concerned in this book with those aspects of systems that are determinate—that follow regular and reproducible courses. It is the determinateness that we shall study, not the material substance.30

Ashby appears to be using determinism as control. The control determines the behavior of the system.

Beer (1959) classifies systems as deterministic and probabilistic, although Beer recognizes the possible similarity of the two categories:

The point is whether a probabilistic system is really a deterministic one which we do not fully understand; it is obviously quite possible that a complete knowledge of the physical universe would do away with probabilistic systems since everything would be fully predictable in terms of understood causes and effects.31

Miller's definition of process is based upon a functional analysis. This definition of process is consistent with the functional, behavioral analysis of cybernetics. A functional analysis of process is similar to an analysis of motion in a machine. It is movement but within a specified structural arrangement.

Miller places a great deal of emphasis upon structure:

The structure of a system is the arrangement of its subsystems and components in three-dimensional space at a given moment of time. This always changes over time.... Spatial propinquity or accessibility to information transmitted over physical channels is essential for all social interactions, except those
based on mutual agreements remembered from past interactions. Even then, spatial contact in the past is essential. Spatial orientation, therefore, is important for both biological and social science... The sciences of living systems will develop most effectively if all such systems are conceptualized as concrete rather than abstracted systems. Their structures exist in specific locations in three-dimensional physical space.32

The structural analysis is apparent in the concept of a physical marker, which transmits information in three-dimensional space at a given moment of time.

All information flows are sequences of patterns that pass over a channel in space-time, from a transmitter to a receiver. Each pattern is conveyed on a marker, a bundle of matter-energy. The pattern cannot be transmitted unless it is borne on a marker.33

Miller justifies his emphasis on structure by pointing out the fundamental need for structural explanations in the development of functional explanations:

The fact that a certain pattern of function occurs repeatedly over time does not justify calling it a "structure." Functionalists sometimes resist the use of space-time coordinates because they seem static. This is a misapprehension. One must first establish such coordinates before observing or measuring any form of motion, flux, or process.34

Miller proceeds to give a definition of process, which is founded upon cybernetic assumptions:

All change over time of matter-energy or information in a system is process....Process includes the ongoing function of a system, reversible actions succeeding each other from moment to moment. ...Process also includes history, less readily reversed changes like mutations, birth, growth, development, aging, and death; changes which
commonly follow trauma or disease; and changes resulting from learning which are not later forgotten. Historical processes alter both the structure and the function of the system. His statements on process are clearly related to a functional analysis. In fact, he equates process and function in his analysis of Leighton:

Leighton has shown that the meanings of structure and function (or process) are not always clearly distinguished.

Miller refers to function when he defines process, and he explains function by stating "operating characteristics."

Ashby's concept of process appears to be similar to Miller as Ashby refers to the functional nature of Cybernetic Theory. Ashby states:

Cybernetics deals with all forms of behavior in so far as they are regular, or determinate, or reproducible.

On Environment Conditions. The cybernetic theory of learning clarifies the theory's dependence upon the Newtonian assumptions of determinism. Both operant conditioning and S-R or associative learning theory assume that behavior is determined by conditioning history. The conditioning factors in the environment cause or determine the organism's behavior. The stimulus comes from the environment, and the response is caused by or determined by environmental conditioning.

The environment determines behavior through two key processes, evolution and learning; both are selection
processes. Selection is a form of choice making. It is also a form of causal explanation. The three key subsystems or processes in Miller's model are the associator, memory, and the decider because these three processes explain the determination of the system's behavior.

The Associator

Miller describes the associator as the first stage of the learning process and memory as the second stage of the learning process. The S-R theory of learning represents Miller's explanation of these crucial subprocesses. The decider controls the system. In cybernetic theory, control or determination of the system's behavior is achieved through the paradigm of negative feedback. The negative feedback process is controlled by the past experience of the system. Learning theory explains how the environment determines the decider function. Negative feedback cannot be explained unless the concept of expected output is adopted. The cybernetic system has a purpose or function which is represented by the expected output. James Miller posits a decider program or template which provides the system's expected output or purpose for the system:

The template, genetic input or charter, of a system is the original information input that is the program for its later structure and process, which can be modified by later matter-energy or information inputs from its environment. This program was
called an 'instruction' by von Neumann....The tem­
plate or charter of an organization 'programs' the
system. It indicates its purposes and goals and
specifies what subsystems it will have initially
and which relationships will exist among them.

The system's program, template, or cognitive map is
determined by two processes; evolution and learning. Evol­
ution develops a genetic code which controls the system.
This program can be modified by the environment through
conditioning and learning. The association subsystem ex­
plains the effects of learning on the decider's program.
The program must be retained if past conditioning deter­
mines present or future behavior. Thus, memory is essen­
tial to cybernetics and negative feedback explanations.

The environment and past experience control and
determine systems in two ways: evolution and learning.
Cybernetics equates these two processes but recognizes
some obvious differences such as time frames.

Evolution is like learning as Pringle has suggested.
Both involve feedback with reward or punishment for
'correct' of 'incorrect' responses. In the case of
the development of a species, these are mutations
either capable of surviving or not....The filter of
environment thus 'rewards' and 'punishes' the spe­cies and results in something very like learning.

**Evolutionary Programs.** The process of evolution uses
rewards (survival) and punishment (termination) to develop
a genetic code or program for controlling the system or
organism. Growth patterns, instinct, and imprinting are
examples of genetic control. The genetic program is
internal, but it does not represent internal or self-determination since the crucial program is determined by past environmental conditioning (evolution). The environment, and not the system, is in control of the actions of the system. Wiener accepts purposes in systems which designate the system's functions, but these purposes are in the form of functional teleology or past conditioning, not creative teleology.

**Learned Programs.** Cybernetic theory must assume a starting or original template or program. Genetic codes or programs provide the initial template. But, cybernetic theory should explain the system's ability to adapt to its environment. The genetic program is inflexible and can only explain behaviors which remain adaptive in stable environments. Genetic programs are too inflexible for rapidly changing environments. Some systems have developed an ability to modify the genetic program, which determines the system's behavior. Miller uses associative learning to explain program and template modifications. Miller develops a two-stage theory of learning; the associator forms the associations, and memory retains the associations which are formed.

Associative learning theory is a stimulus-response theory. Miller identifies several kinds of learning theories:
Several kinds of associative learning have been identified. These are differentiated by the design of the particular experiment and the nature of the information inputs (traditionally called stimuli) and the outputs (traditionally called responses). Organisms are generally thought to be motivated to associate by receiving rewards, inputs to the organism of matter-energy or information that decrease strains (in other words, that reduce drives or satisfy needs...by avoiding punishments, which are stressful inputs of matter-energy or information that increase strains; or both).  

Miller translates the S-R language into terms which are more compatible with cybernetic and information processing models. He states:

The terms 'input' and 'output' seem preferable to 'stimulus' and 'response,' which are used in some of the behavioral sciences, because the former terms make it easy to distinguish whether the transmission is of matter, energy, or information, whereas the latter terms often conceal the distinction.  

Cybernetics adopts the theoretical assumptions of S-R learning theory, but there are cybernetic terms which can be used in place of the psychological terminology. The explanation of the associator is based upon the S-R concept of a stimulus or input eliciting a response or output. A change in the probability of the response is used as an operational definition of learning.

It synthesizes a set of bonds or interrelationships among them so that, at some future time, inputting item A into the system will elicit items B...N, as outputs, each with its own probability....If it does affect the probability, association exists.  

The associator process in organizations is explained by associative learning theory. Miller concludes:
An organization has formed a new association to one item of information when its response to a subsequent transmission of that item or a similar one, from the environment or from within the organization, is altered. This is the usual criterion of associative learning at the level of the organism, and it seems applicable at this level also. The association, according to Deutsch, results from...those inner changes in an organization that occur in response to some repeated outside stimulus and that change the system's subsequent response to it.44

Several issues are relevant to theories of learning. No general agreement about classification of learning theories exists but three basic classifications of conditioning help clarify the theoretical positions; these are classical, instrumental, and operant conditioning. All three theories are conditioning theories. They assume past conditioning determines behavior. Operant conditioning has been considered in the analysis of Skinnerian behaviorism.

Skinner rejects S-R theory and maintains that operant conditioning is distinct from S-R conditioning. Classical conditioning and instrumental conditioning are both forms of S-R or S-O-R conditioning.

The paradigm for classical conditioning was developed by the Russian physiologist, Ivan Pavlov. It involves a natural S-R relation of an unconditioned stimulus (US) and an unconditioned response (UR). The US is paired with a conditioned stimulus (CS), which does not evoke the UR. Pavlov ran a number of trials in which the US (meat) was
paired with the CS (a bell). When the CS (a bell) came to evoke the UR (salivation) in the absence of the US (meat) learning had occurred. Pavlov saw the process of learning as one of stimulus substitution. The response is always the same, but it is made to a new stimulus. Classical conditioning is usually associated with reflex learning.

Instrumental conditioning is closely associated with E.L. Thorndike. Instrumental conditioning is a S-R theory. If a drive or stimulus (S) produces an instrumental behavior or response (R), it can then be followed by a reward or punishment. If a CS is followed by a reward, which the organism can obtain by some behavioral response, then a bond or association will be formed. The association elicits or strengthens the probability of the response. The altering of the probability of behavior or response is defined as learning. If a CS is followed by punishment, which the organism can avoid by some behavioral response, then the bond or association will weaken the probability of the response; learning is the result. Thorndike called this the Law of Effect. Trial-and-error or "problem solving" learning is a variation of instrumental learning. Thorndike (1898) used a dog in a box to see if the animal could "learn" to escape. The dog attempts to "solve" the "problem" of escape. The animal learns to discriminate between responses which solve the problem and result
in rewards, and responses which fail to solve the problem and result in punishment. Trial and error learning is called discrimination learning.

S-R theorists classify operant conditioning as instrumental learning, although Skinner and others reject this analysis. In operant conditioning, a hungry organism is placed in a "Skinner box." Many responses are emitted. By rewarding a particular response, its frequency is increased and learning occurs. By punishing a particular response, its frequency is decreased and learning occurs. Instrumental learning involves a response substitution and classical conditioning involves a stimulus substitution.

When Miller uses the term "associative learning," he is referring primarily to instrumental conditioning (b), although he includes classical conditioning (a) in his classification of associative learning. Miller does not state a clear position on operant conditioning (c), although he implies that it is not fundamental:

One can take the view that only two of the above sorts of learning, (a) and (b), are fundamental. Certain scientists add (c).45

Past Conditioning Determines Behavior. The use of S-R theory in cybernetics is crucial to the theoretical assumptions which are made. It means that cybernetics is fundamentally a deterministic theory. The assumption is
that past conditioning determines present and future behavior. The concept of equilibrium in cybernetic theory is inherent in this determinism. The concept of equilibrium maintains that a system's final state is determined by its initial conditions (or past). The underlying implication of determinism and equilibrium is a closed system paradigm. The initial conditions of genetic programs or codes are explained by evolutionary theory, and Miller has used the same learning theory assumptions to explain evolutionary theory.

Smith has stated that a S-R analysis implies a cause and effect analysis. Smith points out:

Watson was reacting to the wholly subjectivist psychology which preceded him. Such a psychology which relied for its method on introspection seemed hopelessly unscientific when compared to the mechanical precision of Newtonian physics and it was to just such physics that Watson turned for the model of science which he infused into the behaviorist program. Stimulus and response were like cause and effect. The world was deterministic. By running rigorous crucial experiments he felt that scientists could determine precise relationships between variables and by accumulating these relationships could build a science of behavior toward completion. The behavioral scientist was to be objective not subjective.46

An Evaluation of Cybernetic Theory

The S-R analysis implies a Newtonian concept of process. Miller explicitly adopts a Newtonian outlook when he quotes Simon:
...But the great simplification came, of course, with Newton, who showed that the scheme of the heavens could be represented far more parsimoniously by replacing the time paths of planets with the differential equations that generated those paths.

So Simon spoke of only a small part of the sciences of life, recommending the use of formulations like those of Newton, which, in the form of computerized simulations, can generate precise statements explanatory of various aspects of living systems.47

The results are an emphasis upon cause and determinism.

Relationships in concrete systems are of various sorts, including spatial, temporal, spatiotemporal, and causal.

Both units and relationships in concrete systems are empirically determinable by some operation carried out by an observer.48

Although Miller states that his theory is an open system theory, the inherent outcome of his use of S-R theory is a closed system analysis. The Newtonian notion of functional analysis leads to a "static" concept of process and a functional teleology. Viewing process as function leads to a linear sequence, one-way analysis, which assumes a beginning, middle, and end. This is consistent with Newtonian process, but it is not compatible with the dynamic process of Whitehead. Smith states:

Events are expected to occur in a definite temporal sequence. Causality is deterministic; events move linearly. Knowledge of what comes before leads to knowledge of what will come after. Clevenger and Matthews seem to seek a Laplacian demon which can announce the state of the future that has been predetermined by the initial conditions.49
Smith's description of a Newtonian analysis of process is clearly consistent with cybernetic analysis and Miller. According to Miller:

A concrete system can move in any direction on the spatial dimensions, but only forward—never backward—on the temporal dimension. The irreversible unidirectionality of time is related to the second law of thermodynamics....A system tends to increase in entropy over time. Without new inputs higher in entropy to the system, this process cannot be reversed in that system, and such inputs always increase the entropy outside the system. This principle has often been referred to as 'time's arrow.' It points only one way.

The Newtonian sense of process emphasizes structure and sequence. Creative process and mutual-causal analysis are not recognized. The indetermination of causa sui is not appropriate within the cybernetic framework.

Miller's analysis of the retention or memory process is presented in Chapter IV. The memory process is Miller's second stage of learning. It is analyzed in terms of S-R assumptions. The memory subsystem is essential to the control functions in cybernetic systems. An analysis of the decider subsystem and negative feedback indicates memory's function in system's control.

The Decider Subsystem

Cybernetics is the science of feedback control and communication. The decider "process" controls the system. Therefore, the decider subsystem is a crucial subsystem in the cybernetic theory of organizations and systems.
Miller explains:

Decider, the executive subsystem which receives information inputs from all other subsystems, and transmits to them information outputs that control the entire system.... When I use the term "decider" I do not necessarily imply any assumption of voluntarism and free will. The processes of a decider may be wholly determined in exactly the same circumstances always making the same decision.51

The decider subsystem is the control process. Miller uses a series of cybernetic concepts to explain this control function. Negative feedback and equilibrium are crucial control concepts in cybernetic theory, and Miller applies them to explain the decider.

The Principle of Equilibrium is the principle of stability. Stability is characterized by an absence of change. The absence of change in systems results in stable or steady states (or homeostasis). Miller observes:

When opposing variables in a system are in balance, that system is in equilibrium with regard to them.... All living systems tend to maintain steady states (or homeostasis) of many variables, keeping an orderly balance among subsystems which process matter-energy or information.52

Stability is usually represented as a range of stability in cybernetic systems. If an input or output forces the system beyond its range of stability, the system becomes unstable.

An input or output of either matter-energy or information which, by lack or excess of some characteristic, forces the variables beyond the range of stability, constitutes stress and produces a strain (or strains) within the system.53
The cybernetic concept of the homeostat represents a machine which directs a system towards a steady state or equilibrium after the state has been disturbed or becomes unstable. The homeostat is a purposeful machine because it has a goal, represented by the system's expected outcome. The system is represented as moving towards equilibrium or a steady state. In the long run according to cybernetics, all systems move towards the final state of equilibrium known as entropy (The Second Law of Thermodynamics). Entropy is a final state of complete randomness, chaos, and disorder.

**Negative Feedback.** The homeostat is a device for maintaining a steady state. Miller calls his organizational homeostats "adjustment processes."

Those processes of subsystems which maintain steady states in systems, keeping variables within their ranges of stability despite stresses, are *adjustment processes.*

Adjustment processes are negative feedback processes. Negative feedback adjusts for error between the actual output and the expected output. This error adjustment decreases deviation from the system's goal of stability, steady state or equilibrium.

When the signals are reversed, so that they decrease the deviation of the output from a steady state, it is *negative feedback.* Negative feedback maintains steady states in systems. It cancels an initial deviation or error in performance....The result is that the system adapts homeostatically to its environment.
Feedback is the transmission of information from the output or actual behavior back to the input. Miller outlines the meaning of feedback:

The term feedback means that two channels exist, carrying information, such that channel B loops back from the output to the input of channel A and transmits some portion of the signals emitted by channel A (see Figure 3).

Figure 3. Negative Feedback.

The figure represents the negative feedback loop. The main channel A is the control; it receives signals from its regular input channel, from the actual output or channel B (the feedback channel), and from the comparison signal of expected output from memory. The comparison
signal represents the system's purpose or desired steady state. The difference between the expected output (the comparison signal) and the actual output (the feedback signal) represents error. The control channel's new output is adjusted for error, or deviation from the reference signal. Thus, the system "aims at" a state of equilibrium represented by the expected outcome of the reference signal. The reference signal controls the system by giving the system its purpose or function. The computer analogy leads to the conception of a program (the reference signal) controlling the output or behavior of the system.

The most important theoretical concept in the negative feedback adjustment is the reference signal. The control of the system is dependent upon a reference signal in memory, which directs the choices of the system. A system can not control or adjust its actions with negative feedback unless it has a reference signal. Since the program controls the system, it is important to know how a program establishes the comparison signals. The cybernetic answer is by past experience. The genetic program is developed by experiences through the evolutionary program. Genetic programs are altered by experience through the process of learning. Wiener conceives the learning process as a negative feedback
adjustment process since learning alters behavior by feeding back information about past experience. Ultimately, this analysis leads to the deterministic position that systems are controlled by past environments represented by past experience.

Four Stages in the Decision Process. Negative feedback control is the basis for Miller's decider subsystem. The decider subsystem consists of four stages of decision making: (1) establishing purposes or goals, (2) analysis, (3) synthesis, and (4) implementing the decisions. Stage one establishes goals or purposes. According to Miller:

Establishing purposes or goals—in this stage is determined the internal steady state (purpose), or external target or relationship (goal) which the system should attempt to attain;...

Purpose and goal—by the information input of its charter or genetic input, or by changes in behavior brought about by rewards and punishments from its suprasystem, a system develops a preferential hierarchy of values that gives rise to decision rules which determine its preference for one internal steady-state value rather than another. This is its purpose. It is the comparison value which it matches to information received by negative feedback in order to determine whether the variable is being maintained at the appropriate steady-state value.57

Cybernetic purpose is the comparison signal or reference signal or program or genetic code or charter. All these terms are used interchangeably by Miller. The preferred steady state, represented by the comparison signal, can be changed by the learning process, represented
by the associator subsystem. This conceptualization of the development of purpose means that the external environmental suprasystem is the ultimate decider. The environment determines or controls the system by conditioning. The purposes are given by a suprasystem. The designer who designates the function of a machine is establishing its purpose. Miller asserts that purposes are given to the organization by its suprasystem, society. The organization can "learn" new purposes through rewards and punishment. Miller further describes purposes by stating:

An organization comes into being to carry out specific subsystem processes in the society of which it is a component. Its original purposes, defined as preferences for particular internal steady states, are given in its charter or in laws of the society that apply to it....These purposes can change over time as a result of rewards or punishments from the suprasystem.58

Stage two, analysis, is the comparison step in the negative feedback loop. The comparison signal from stage one is compared to the actual behavior of the system. The actual behavior must be feedback to the controller.

Any discrepancy between the present state of a variable in an organism and the comparison signal indicating the appropriate steady-state value for that variable constitutes a problem requiring decision making, or problem solving.59

Miller's analysis of stage two consists mainly of a structural analysis of feedback channels in organizations. For example:
Study of feedbacks about the system's current state of attainment of purposes and goals is a necessary first stage of analysis: .... In order to evaluate how well any system is attaining its specific purposes and goals, it is essential to obtain operational measures of performance.60

Miller also introduces the concept of choice or selection in the analysis stage. How does the decider make a selection or choice? The decider chooses on the basis of past conditioning. Miller's perspective is:

It remains to ask how men and societies choose from among these alternatives, when choose they must. In brief, the answer is 'by experience.'61

Analysis involves a search for alternatives. Information is input to the decider. The decider searches for alternatives and then proceeds to the next stage, synthesis.

Stage three is synthesis in which the number of alternatives are limited to what desirable behaviors will help develop stability. Miller explains:

In this stage, processes—usually logical in nature—are carried out to diminish available alternatives to a lesser number characterized by the ability of decreasing to a satisfactory degree the deviation of the system from the comparison signal.62

Some theorists describe synthesis as uncertainty reduction. Uncertainty is reduced by selection. The selection process results in the choice of the desired output or behavior. According to cybernetics, a program or reference signal is essential if selection is to take place. Miller maintains:
A common and important aspect of synthesis is the existence of an overall program which determines what alternative to select in each single choice of a sequence.\textsuperscript{63}

The program determines the system's actions; past experience determines the program or "schemata."

A similar theoretical formulation holds that new situations are compared with "schemata" stored in the memory. These are either determined genetically or gained through past experience,...\textsuperscript{64}

Stage four is implementing. Command signals are sent out by the decider. These command signals implement the behavioral actions, which were selected in the stage of synthesis.

\textbf{An Analysis of the Implications of Cybernetic Theories Assumptions}

Cybernetic theory is not compatible with Bertalanffy's and Whitehead's concept of dynamic process or creative teleology or \textit{causa sui}. The cybernetic concept of self-regulation is based upon the assumptions of S-R theory. Self-regulation is not equivalent to self-determination. The S-R assumption is that the environment determines a program which provides the comparison signal for the negative feedback loop. That program is the essence of the self-regulating machine or servomechanism. But, the environment determines the program. Cybernetics is based upon past conditioning. Bertalanffy's General System Theory is based upon a self-determining system.
The key question in a cybernetic analysis is: how is the program determined? Miller does not appear to give adequate attention to this question, but some of his statements are very revealing. For example:

I shall not imply that the norm as to what the goal should be is established in any absolute way, but rather that it is by the system's suprasystem when it originates its template, or by rewards and punishments.65

The program is not created by the system. It is imposed upon the system; therefore, the program is not self caused. It is determined by the suprasystem through evolution or learning.

Miller's explanation of organizations is based upon this analysis. Organization's original purposes are given by society and modified by instrumental learning. The comparison signal is externally determined, not internally determined. "Usually some external standard is available as a comparison signal against which feedback from the system's achievements can be evaluated."66

Miller's analysis is consistent with Ashby's analysis of servomechanisms in very large systems. Ashby's concept of the designer is equivalent to external determination or past conditioning in learning theory. Ashby clarifies:

The designer's act of selecting one model from many is equivalent to some determining factor fixing an input at a permanent value....Thus the act of 'designing' or 'making' a machine is essentially an act of communication from Maker to Made, and
the principles of communication theory apply to it. ...It will be noticed that the operation of 'design,' as understood here, can be carried within a Black Box, if it has an input. In fact, the owner of the radio set (S.13/12), if he knows nothing of its contents, but does know how the output is affected by the switch, does perform the act of 'design in a Black box' when he sets the switch and gets the desired behavior.67

The use of the "black box" analogy is interesting because it begs the crucial question of how the program is determined in the negative feedback loop. The black box becomes a vitalistic explanation, a controlling force which cannot be explained. Skinner's analogy of the puppet is very appropriate. The S-R analysis needs someone to hold the strings (see Stafford Beer for a more complete analysis of the cybernetic "paradox").68

A General System Theory of Organizational Communication

The development of General System Theory (G.S.T.) has also provided a paradigm for studying organizational communication. The G.S.T. paradigm suggests a framework which is consistent with Whitehead's concept of process and the concept of creative teleology. The creative teleology of systems is the key concept in understanding the process or dynamic relationships of systems.

Bertalanffy maintains the view that systems are guided by a form of creative teleology, which is represented by the concept of equifinality. Cybernetics explains the role of mechanistic, functional teleology in systems, but
cybernetics fails to account for creative teleology. Thus, Bertalanffy differentiates cybernetic theory and G.S.T.

Systems theory also is frequently identified with cybernetics and control theory. This again is incorrect. Cybernetics, as the theory of control mechanisms in technology and nature and founded on the concepts of information and feedback, is but a part of a general theory of systems; cybernetic systems are a special case.

Bertalanffy often uses the contrast between Cybernetic Theory and G.S.T. concepts to clarify his position. Both concepts will be related to Whitehead's position.

Bertalanffy has established G.S.T. in order to find the principles and laws which apply to systems in general.

In this way we postulate a new discipline called General System Theory. Its subject matter is the formulation and derivation of those principles which are valid for 'systems' in general.... General system theory, therefore, is a general science of 'wholeness'....

Organizations can be viewed as systems. Therefore, G.S.T. can be applied to the study of organizational communication. Bertalanffy hopes to replace the mechanistic paradigm of classical physics with a paradigm based upon wholeness, openness, nonlinearity, mutual causality, equifinality, equipotential, interrelated, dynamic, self-regulating, complex, emergent, ordered systems. Bertalanffy's concepts apply to open living systems, which can be distinguished from the closed linear systems described by cybernetic concepts. Bertalanffy's definition of a
A system is process oriented. The definition emphasizes interaction and dynamics of the "whole."

These conditions are not fulfilled in the entities called systems, i.e., consisting of parts 'in interaction.' The prototype of their description is a set of simultaneous differential equations (pp. 55ff), which are nonlinear in the general case. A system or 'organized complexity' (p. 34) may be circumscribed by the existence of 'strong interactions' (Rapoport, 1966) or interactions which are 'nontrivial' (Simon, 1965), i.e., nonlinear.1

Open systems are regulated by relationships, not by feedback loops.

Open Systems

An open system maintains its identity as a "system" in spite of a continuous metabolistic change in inflow, outflow, and components. As Bertalanffy states:

The system remains constant in its composition, in spite of continuous irreversible processes, import and export, building up and breaking-down, taking place. The steady state shows remarkable regulatory characteristics which become evident particularly in its equifinality.72

M. Braham observes:

Von Bertalanffy's statement for organic organizations, regarded here as applicable to all organizations, is that 'so long as an organic system has not reached the maximum organization possible to it, it tends toward it.'73

Open systems can maintain order and even move towards an increase in order and complexity. Closed systems move towards increasing entropy or disorder. In open systems the final state (finality) is indeterminate and equifinal.
The indeterminate nature of equipotentiality is an important distinguishing characteristic of open systems. The concept of equipotentiality is similar to Whitehead's concepts of the "real" and "concrescence." The future is "merely real." The organizational process is the passing from the potential to the "actual." Cybernetics explains in terms of the "actual," efficient cause, the determinate outcome. G.S.T. explains in terms of potentiality, creative teleology, equifinality, and indeterminate process. G.S.T. gives explanations in terms of organizations which are emerging from organizing processes. Cybernetics explains in terms of the actualities that have already "become."

**Systems as Process**

Systems are always in the process of "becoming." If process ceases, the system loses its identity, i.e., it is no longer a system. G.S.T. attempts to explain the dynamic processes which characterize open, living systems. Primary regulation is attained through complex, mutually causal relationships. Secondary regulation is explained by the circular causality of negative feedback loops. Primary regulation is consistent with Whitehead's notion of the many becoming the one. The many relationships constitute the one unified system. Braham states:
This condition has been designated as the 'holistic' principle. According to one of its foremost proponents, Smuts, 'Holism, as its very idea implies, a tendency towards unity, a blending and ordering multiple elements into new unities."

Bertalanffy also comments on the unified system:

As long as a system is a unitary whole, a disturbance will be followed by the attainment of a new stationary state, due to the interactions within the system. The system is self-regulating.

The system seeks to achieve the final state of unity which is characterized by a movement toward order. The system's potential for order is the final state, which provides the creative teleology of the system.

The movement of open systems towards finality is characterized by the indeterminism of equifinality. Open systems are emergent, not determinate. Braham observes:

The product of the organizational process, that is to say, an organization, is not, however, generalizable. A particular organization is an emergent, a function of the organizational process, its own genotypic and phenotypic potentialities and the environing conditions within which it exists. It is thus unique. As such, it must also be understood as irreducible to the components of which it is comprised, for it is subject to what Von Foerster calls a 'super-additive non-linear composition rule where some measures of the whole is more than the sum of the measure of the parts;..."

The behavior of the system emerges from process and the equipotentiality of the system. In contrast, behavior of closed systems is determined by the initial conditions rather than by potentiality. Closed systems are summative while open systems are constitutive.
An Analysis of the Implications of General System Theories' Assumptions

Bertalanffy's analysis is based upon Whitehead's notion of process. Whitehead's concepts form the foundation of G.S.T. The emphasis is upon dynamic interaction. The process of "becoming" defines the system. The physical attributes are secondary. Relations are primary. Potentiality, teleology, and equifinality are important characteristics of organizations and systems. Emergence is more important than determinism. The development of a system's potential over time through process is inconsistent with Whitehead's notion that "becoming" is what is important.

Equifinality and steady state are concepts which emphasize order as opposed to the cybernetic concept of entropy. Open systems have a teleological direction, which is defined as order, not disintegration. Teleology is not defined narrowly within a mechanistic framework. Causality is explained in terms of equifinality and finality. The system's potential for becoming is what is important. Behavior is defined by emergence, not determinism. Systems are capable of novel behavior because the final potential for order can be approached from different initial conditions and different evolving pathways. Relationships regulate the system's emergence. The designer,
programs, and negative feedback loops play a secondary role. The "real" or potential does emerge into the actual. Cybernetics does help account for what has emerged, but G.S.T. accounts for novelty and creativity.

G.S.T. does offer a framework for analyzing organizational communication from a Whiteheadian process perspective. Since the operative memory is also viewed as an organizational process, G.S.T. offers a similar framework for analyzing organizational memorizing.
Chapter III

Footnotes


4Ibid., pp. 30, 32.

5Luthans, op. cit., pp. 2, 6, 11, 12.

6Ibid., p. 18.

7Ibid.

8Ibid., pp. 28, 29.

9Skinner, About Behaviorism, op. cit., p. 223.

10Ibid., pp. 167, 168.


12Ibid., p. 15. See also About Behaviorism, p. 73.

13Luthans, op. cit., p. 64.

14Ibid., p. 69.

15Ibid.

16Ibid., pp. 65, 176.

17Ibid., p. 182.

18Ibid., p. 80.

19Ibid., p. 144.
20 Skinner, Beyond Freedom and Dignity, op. cit., p. 18.
21 Ibid., p. 152.
22 Ibid., pp. 185, 186.
23 Ibid., p. 199.
27 Ibid., p. 1.
28 Ibid., p. 3.
29 Ibid., p. 46.
32 J.A. Miller, op. cit., pp. 21, 22, 1026.
33 Ibid., p. 1027.
34 Ibid., p. 1026.
36 Ibid., p. 23.
37 Ibid., p. 633.
38 Ashby, op. cit., p. 1.
39 Miller, op. cit., pp. 34, 608.
40 Ibid., p. 77.
41 Ibid., p. 407.
Ibid., p. 34.
Ibid., p. 65.
Ibid., p. 637.
Ibid., p. 409.
Smith, op. cit., p. 177.
Miller, op. cit., p. 89.
Ibid., p. 17.
Smith, op. cit., p. 176.
Miller, op. cit., pp. 11, 60.
Ibid., p. 67.
Ibid., p. 34.
Ibid., p. 34.
Ibid., p. 35.
Ibid., p. 36.
Ibid.
Ibid., pp. 39, 68.
Ibid., p. 651.
Ibid., p. 432.
Ibid., p. 654.
Ibid., p. 37.
Ibid., p. 68.
Ibid., p. 433.
Ibid., p. 434.
Ibid., p. 39.
Ibid., p. 654.
68 Beer, op. cit., see Chapters 19, 20.
69 Bertalanffy, op. cit., p. 17.
70 Ibid., pp. 32, 37.
71 Ibid., p. 19.
72 Ibid., p. 142.
74 Braham, op. cit., p. 17.
75 Bertalanffy, op. cit., p. 70.
This chapter develops three theoretical views of memory. Skinnerian behaviorism, cybernetic theory, and general system theory all have separate theoretical perspectives which affect their concept of memory. Chapter III has developed a framework for studying organizational communication. The process perspective of organizational communication leads to the designation of memory as a subsystem of the larger organizational system. The memory process is an important part of the organizational system. But, the concept of memory varies according to the theoretical assumptions which are adopted.

A Skinnerian Behaviorist Theory of Memory

B.F. Skinner does not accept the concept of memory. The radical behaviorist position is that memory is a concept of cognitive psychologist. Memory is a mentalistic explanation; therefore, it is an invalid explanation.

Much of the misunderstanding about an inner man comes from the metaphor of storage. Evolutionary and environmental histories change an organism, but they are not stored within it....The environment...
is often said to be stored in the form of memories; to recall something we search for a copy of it, which can then be seen as the original thing was seen. As far as we know, however, there are no copies of the environment in the individual at any time, even when a thing is present and being observed....The contingencies are not stored; they have simply left a changed person....A person is changed by the contingencies of reinforcement under which he behaves; he does not store the contingencies. In particular, he does not store copies of the stimuli which have played a part in the contingencies. There are no 'iconic representations' in his mind; there are no 'data structures stored in his memory;' he has no 'cognitive map' of the world in which he has lived. He has simply been changed in such a way that stimuli now control particular kinds of perceptual behavior.¹

But, if there is no mind and no memory how do past contingencies affect behavior? Skinner says the probability of performance is changed and that is the way in which past contingencies affect behavior.

In a behavioral analysis probability is substituted for accessibility. The contingencies which affect an organism are not stored by it. They are never inside it; they simply change it....Techniques of recall are not concerned with searching a storehouse of memory but with increasing the probability of responses.²

If the past is a change in the probability of a performance, it can be measured. Since it can be measured, Skinner maintains it is scientific. The mentalistic concepts of memory are not measurable nor observable and, therefore, not scientific. Skinner still faces another question. If the mind is not changed, what is changed? Skinner says the probability of performance. But, what mechanism
initiates the change in probability? How can the mechanism be based upon past contingencies unless something is retained? How is there change without a retention mechanism?

**Luthans Extends on Skinner's Theory.** Luthans adopts Skinner's description of response frequency. Luthans' description clarifies the behaviorists' tendency to define concepts in purely operational terms. Thus, the claim that behavior is predictable and controllable.

Probability goes hand in hand with the prediction of the future. Applied to frequency of response, probability is an extrapolation of the past; it is an inference based upon past rate of responding. The stronger a response, as indicated by its frequency of occurrence, the greater its probability of reoccurrence. By the same token, the weaker a response, the lower its probability of reoccurrence.

...The relationship between the past and future dimensions of response frequency is subtle, but important. With regard to behavior prediction and control (the future), the behavior modifier attempts to alter the probability of response by systematically and consistently managing the consequences of observable behavioral events. Unavoidably, the success or failure of such behavior modification efforts is revealed in a carefully kept record of response frequency (the past). In this manner, both dimensions of response frequency are appropriate to a science of learned behavior.²

Although Luthans understands the concept of response frequency, it seems he might not be aware of the theoretical assumptions upon which it is based. Luthans uses memory (unlike Skinner) to explain the "record" keeping function.
Records of such response frequency may be formally recorded on paper or recorded in a person's memory. Whether aware of it or not, most people carry countless response records in their memory. The common practice of labeling people shows this to be true.4

Theoretical positions are advocated on the basis of critical theoretical assumptions. But, the assumptions seem to be contradicted when problems are encountered. Luthans' attack on mentalistic explanations is not consistent with his use of mentalistic explanations. Skinner indicates his frustration with shifts in assumptions.

Total internalization was recently announced by three cognitive psychologists who, upon completing a book, are said to have declared themselves 'subjective behaviorists.'5

Implications of the Behavioral Position. The behavioral analysis of retention and memory is inconsistent with an analysis of the organizational memory process. The behavioralist's denial of internal mediational activity leads to a rejection of internal mediational explanations. Skinner rejects the concept of memory because he classifies it as an internal mediational concept, which is not consistent with Skinner's functional analysis. Skinner accepts the paradigm of operant conditioning as a comprehensive explanation of behavior. Thus, additional mediational explanations are not necessary. They are not compatible with Skinner's functional-mechanistic view of process or static teleology. Skinner's denial of
indeterminate process, equifinality, and creative process means the behavioral theory has little relevance to the final model of the memory process. Skinner's assumptions are not consistent with Whitehead's notion of process.

A Cybernetic Theory of Memory

The concept of memory is crucial to Cybernetic Theory. Memory is essential to cybernetic systems since the reference signal or program must be retained for use by the decider. Cybernetic systems are controlled by negative feedback loops, which require memory and associative learning. Thus, Wiener equates memory and learning:

The physiological condition for memory and hence for learning seems to be a certain continuity of organization, which allows the alterations produced by outer sense impressions to be retained as more or less permanent changes of structure or function.... Cybernetics takes the view that the structure of the organism is an index of the performance that may be expected from it. This explanation also means that learning is a form of feedback.

This form of learning is most certainly a feedback, but it is a feedback on a higher level, a feedback of policies and not of simple actions. Although Miller maintains that cybernetic systems have three critical control subsystems, it is evident that they can be viewed as a single subsystem involving the negative feedback loop. The associator and decider have
been reviewed in Chapter III. An analysis of the memory subprocess is appropriate at this point.

Learning and the Memory Process

Miller defines memory as, "the second stage of the learning process, storing various sorts of information in the system for different periods of time." The memory subsystem stores the programs, templates or cognitive maps, which are a product of the associator or first stage of the learning process. The association stage establishes the program or comparison signal. But, if the change in the system is to be maintained over-time, it must be retained; therefore, learning is a two-stage process.

Traditionally memory and recall or retrieval have been considered stages which can occur after associating in the learning process. It is true that associating can be demonstrated only through memory and recall, but they seem to be independent processes.

The memory subprocess involves three stages:

....a) putting into storage markers bearing the information, b) maintaining them in storage over time, and c) retrieving from storage the information on the same markers or read out onto others...

For most levels of living systems little is known about the rationales of storage, search, and retrieval....

Past Experience. In cybernetic theory memory stores the past experiences represented by learned associations. Miller states:

In conditioned responses a system acquires a new input-output relationship as a result of experience.
Any system has a history of past experiences; this history is retained by the system. The past experiences alter the system and, therefore, determine the present behavior of the system.

History, then, is more than the passage of time. It involves also accumulation in the system of residues or effects of past events (structural changes, memories, and learned habits). A living system carries its history with it in the form of altered structure and consequently of altered function also. So there is a circular relation among the three primary aspects of systems—structure changes momentarily with functioning, but when such change is so great that it is essentially irreversible, a historical process has occurred, giving rise to a new structure.¹²

The past behavior of the system is determined in part by the past environment.

Because some stored information comes from the environment or suprasystem, the memory is to a degree a mirror or map of the environment, a cognitive map which is constantly being altered by new inputs of information....¹³

But the mirror is not faithful. It reflects the past but with some alterations. The system samples the environment, filtering out rejected information. The memory subprocess not only retains information, but it also alters the information by omissions and additions. Miller suggests:

Information stored in the memory of a living system increasingly over time undergoes regular changes—e.g., omissions, errors, or addition of noise, and distortions—resulting from processes of selection, reorganization with other stored information, interpretation, and entropic decay of organization.¹⁴
Programs. Miller indicates how past experiences are stored. He uses Tolman's concept of cognitive maps. This concept is similar to G.A. Miller's concept of programs or "schemata" used for decision making.

As Tolman pointed out, each of us carries with him a 'cognitive map' of the organization of his environment, of greater or lesser accuracy—stored information, memories, which are essential for effective life in that environment.15

Miller's analysis of organizational memory is based upon the cybernetic framework. His analysis emphasizes structural-functional aspects of the system. For example, Miller emphasizes information markers, markers are observable and subject to physical laws.

Communication of almost every sort requires that the marker move in space, from the transmitting system to the receiving system, and this movement follows the same physical laws as the movement of any other sort of matter-energy.16

The concept of marker leads to an emphasis upon structural concepts like upward and downward components of memory. There is an emphasis upon physical and structural components. Miller states:

The subsidiary organizations, groups, and departments responsible for storage and retrieval of the voluminous records that most organizations must keep are living components of this subsystem. These include filing departments, bookkeeping departments, cashiers, secretaries, and computer programmers and operators. In addition, groups and departments of bibliographers, librarians, and curators....17
Even when Miller considers the four phases of storage: (1) reading into storage, (2) maintaining information in storage, (3) loss and alteration during storage, and (4) retrieval from storage, he still maintains his emphasis upon physical, structural components. For example:

Organizations, in primitive societies and informal organizations, usually small, whose essential processes are similar to those of groups, depend largely or completely upon the memories of their human sub-components. The larger, more formally structured systems record a greater proportion of their information flows in written, printed, taped, or microfilmed form or read it into computer memories.¹⁸

Two characteristics of organizational memory given by Miller are: 1) the very large capacity of memory as measured in bits, and 2) the wide dispersal of information within the system.

Although cognitive psychology uses the same cybernetic paradigm that Miller used, the psychological model is more comprehensive. An analysis of the cognitive model of human memory should contribute to a better understanding of the cybernetic framework. More importantly, it will demonstrate the implications of the theoretical assumptions of the cybernetic model.

**Psychological and Organizational Models.** Organizational processes for maintaining past information are not psychological processes. Organizations can use individuals to retain information, and psychological explanations
may be applied to the individuals. But, organizational processes for maintaining past information are not based solely or primarily upon individual retention. The organizational processes involve complex social transactions, which are distinct from individual psychological processes. Organizational processes are super-individual processes. Katz and Kahn indicate the dangers of failing to distinguish between individual and social processes. They state:

The biological metaphor with its crude comparison of the physical parts of the body to the parts of the social system, has been replaced by more subtle but equally misleading analogies between biological and social functioning. This figurative type of thinking ignores the essential difference between the socially contrived nature of social systems and the physical structure of the machine or the human organism.  

The cognitive psychology model can help us understand fundamental characteristics of the memory process. But, the psychological model of memory is not equivalent to the information maintenance process in organization.

The empirical findings of behavioral psychology have dominated discussions about mediational factors. Cognitive psychology had difficulty developing adequate empirical support. The development of information and cybernetic theories led to the development of new research paradigms, which have had a great deal of impact in the areas of memory and attention research. Research in the 1950's,
1960's, and 1970's has led to a comprehensive psychological theory of memory and attention. The empirical findings of cognitive psychology have challenged behavioral formulations. Cognitive psychology has advanced by using the Human Information Processing Model (H.I.P.). G.A. Miller (1956) and Broadbent (1958) helped formulate the H.I.P. model. David Mortensen leaves little doubt regarding the original source of this model.

The problem of how man translates raw sensory data into meaningful experience is the concern of information processing. Originating in the study of cybernetics, the concept of information processing tries to explain human behavior by drawing parallels with electronic processing machines.20

Development of the H.I.P. Model

It is not possible to provide a full review of cognitive psychology's perspective on memory and attention. Many of the psychological concepts would go beyond the scope of this analysis. H.I.P. research has heuristic implications. H.I.P. research has also helped to develop a cybernetic model of memory. This review of H.I.P. research is not meant to be inclusive. The development of the model and the related concepts are based upon numerous empirical studies. It is not possible to evaluate all the numerous research findings. There is still a great deal of active research, and many fundamental issues remain unsettled. This analysis will outline the H.I.P. model;
it will not attempt, however, to draw final conclusions about specific concepts within the H.I.P. model.

**Limited Capacity.** Because the information processing model is based upon cybernetic analysis, the H.I.P. models of memory and attention tend to be structured, linear, and sequential. They emphasize structural components and mechanisms. There are a series of stages represented as structural compartments. Information is processed in sequence through these structural mechanisms. As information progresses through the information processor, it is transformed. The transformations can decrease, maintain, or increase the information. The model is not only an explanation of memory, but it also explains a series of interrelated psychological processes that are difficult or impossible to separate. Posner clarifies:

> Someplace along the line the capacity of the human to deal with incoming information is severely limited. It is as if at some stage of the analysis of incoming information, only a small portion of the incoming signal is selected for further processing. The study of the phenomenon of attention is the study of this limitation on selection.  

In fact, several processes are involved in H.I.P. They include perception, detection, pattern recognition, discrimination, symbol creation, attention, central processor or decision maker, memory, and response. Not only are these various subprocesses closely related, but they also compete for a limited processing capacity. Shannon's
(1948) concept of channel capacity is used in an attempt to measure the limits of this processing capacity. Welford's (1960) single-channel hypothesis represents this concept:

Language skills involve both memory and transformation. The single-channel hypothesis suggests how these processes interact in human information processing. In short, man is viewed as a single channel limited in the amount of information that can be processed simultaneously. This limitation involves not only the information transmission rate, but also the size of the transformations involved in producing the output from the input information. Both incoming stimuli and information stored in short-term memory compete for the limited capacity.22

The Filter Model

The initial information processing model was Broadbent's (1958) filter model. Broadbent's model was based upon experiments using Cherry's (1953) shadowing techniques.

Broadbent represented attention as a selective filter responsible for determining what information would be processed. The filter was an all-or-none device which selected information on the basis of gross physical characteristics, not meaningful content. Swets summarizes Broadbent's theory by stating:

Information enters the organism over many parallel sensory pathways, and the total quantity of this input usually exceeds the limited capacity of the single central channel (the 'P-system'). To prevent overloading the P-system, a 'filter' is posited that admits only part of the input at any one time.23

Neisser extends upon the selective filter concept.

That is, such characteristics as voice quality and location are detected in the box marked 'selective
filter'...while the words themselves are identified only in the box marked 'limited capacity decision channel.' This channel is never reached by voices with the wrong pitch or the wrong spatial location.24

Norman provides a flow diagram of Broadbent's filter theory (Figure 4).

![Filter Model of Attention: Broadbent](image)

**Figure 4. Filter Model of Attention: Broadbent.**

**Cybernetic Assumptions.** Broadbent's model illustrates the cybernetic assumptions of H.I.P. The emphasis is upon structure and function, not process. It assumes a single channel. Information is processed in sequence through a specific processing channel. A "bit of
information" can not proceed to the filter mechanism until it has entered the short term memory mechanism. Information can not enter the decision making channel (or P-system) until it has been filtered. Information can not enter the long-term memory until it has been processed by the decision making mechanism. The model follows the Newtonian mechanistic assumptions of cybernetics, in that cognition is represented in terms of structural mechanisms. Each memory function and cognitive function is processed by a specific structural processing mechanism. The flow of information is described structurally. Information flows in channels which link the mechanisms. Information flows from mechanism to mechanism in fixed structural pathways, in a fixed sequence. The emphasis is upon measurement, prediction, and structural-functional analysis.

The H.I.P. model attempts to explain a series of processing functions which relate to perception, memory, attention, and response. There are three fundamental "subprocesses" or functions: 1) acquisition, 2) retention, and 3) retrieval. Many researchers add additional functions such as central processing (Mortensen, 1972), or alteration during storage (Miller, 1978) or the seven-stage process (Deutsch, 1963) or search (Krippendorff, 1975). There are a series of issues and concepts which are associated with the three fundamental functions of memory or
information processing.

**Information Acquisition.** The study of information processing is closely related to the study of human memory. This analysis will consider the three fundamental subprocesses primarily within the context of human memory. **Information acquisition** is critical because if an event is not processed or acquired, nothing can be done subsequently to retain or retrieve the event. The H.I.P. model suggests that the capacity to acquire, retain, and retrieve items of information is severely limited; therefore, acquisition involves selection. If information was not selectively acquired, the processing capacity would be severely overloaded. A patternless chaos of uninterpretable data would be the result. Acquisition of information is related to the selection or attention process, and acquisition also involves a reduction transformation. More information is potentially available than can be processed by the limited capacity channel. First, the senses select only some stimuli for further processing. Second, a selective filter or attention mechanism determines which stimuli will be available for further processing.

**Retention: Short and Long Term Memories.** The H.I.P. model posits a retention mechanism for holding information until the central processor has the capacity to process the information for long term storage. The model
distinguishes between a short term holding memory (STM) and a more permanent long term memory (LTM). STM and LTM correspond to James (1890) primary (PM) and secondary memory (SM) and to Waugh and Norman's (1965) PM and SM. The processing of information from PM to SM is illustrated by Waugh and Norman. According to their model (Figure 5):

![Memory Model: Waugh and Norman](image)

Figure 5. Memory Model: Waugh and Norman.

Incoming stimuli enter a short term holding memory (PM) which maintains information for a few seconds. The PM acts as a "buffer" between perception and SM. The capacity of the PM is limited, and information is retained for about thirty seconds. Unless the information is selected for further processing, it is quickly forgotten.
Forgotten information is unavailable for future reference. If the information is attended to, it enters the more permanent SM. But, processing capacity is limited; information can be retained for only a short time. The time information is available for processing into SM can be extended or prolonged by the rehearsal process. Rehearsal denotes an internal repetition or recall of an item of information. Rehearsal also makes demands upon the limited processing capacity. So long as information is in PM, it can be transferred to SM.

**Processing Associations.** Processing information for acquisition involves association, organization, and hierarchy. Information is not simply transferred to SM. It is processed or transformed. Organization and association help retention and recall. The processor modifies the information that enters memory. People relate or associate incoming stimuli with conceptual category systems. Verbal language codes are examples of categories. Items are associated with categories and with other items. Items are associated by organizing them into categories. Association establishes organization. Incoming items are coded into meaningful conceptual categories. People associate incoming stimuli with cognitive symbols. Experiences are encoded into internal representations, usually language symbols. Increasing associations and organization
results in an increase in meaningfulness. Processing establishes meaningful patterns of information through linking and associating items into organized categories, which establishes several levels of organization and association.

"Chunking." George A. Miller's explanation of the "chunking" process is an explanation of an organizational process. Using Information Theory G.A. Miller sets the span of immediate memory (PM) at seven + two. This is consistent with the concept of limited processing ability. Norman summarizes G.A. Miller's findings:

Immediate memory appears to be limited by the number of items, regardless of the information content of the items. Because of this, Miller found that the apparent memory span could be increased by a recoding process. Normally, when we try to remember a list of items, we can immediately recall about seven of them. If, however, we were first to learn a code word for every possible pair of items we could easily retain a string of seven code words. Thus, without overloading our normal memory span of seven, we could fool an observer into thinking that our span was actually 14 items. This process of increasing the memory span by efficient grouping of old items into new items, Miller called chunking.27

The process of chunking is based upon forming associations between codes or categories and incoming items of information. By increasing the meaningfulness of incoming data, the span of memory is extended. As G.A. Miller states, "The process of organization enables us to package the same total amount of information into far fewer symbols, and so eases the task of remembering."28
The chunking process can also be repeated; chunks can be chunked. Information is coded, then recorded. Symbols can establish categories. Categories of symbols can be recoded into more abstract categories. Thus, a hierarchy of meaningful chunks is created. Miller observes:

We must recognize the importance of grouping or organizing the input sequence into units of chunks. Since the memory span is a fixed number of chunks, we can increase the number of bits of information that it contains simply by building larger and larger chunks, each chunk containing more information than before....In the jargon of communication theory, this process would be called recoding.... In my opinion the most customary kind of recording that we do all the time is to translate into a ver-bal code....The well-known experiment by Carmichael, Hogan, and Walter on the influence that names have on recall of visual figures is one demonstration of the process.29

The chunking process, which includes encoding and recoding, links items into a hierarchy of associations. The result is a meaningful organization of incoming data. Organizing information increases the amount of information which can be remembered. Hunter states:

When a person approaches any memorizing task, he brings to it those long-term patterns of retaining which he has cumulatively built up through past experience. It is in terms of these patterns that he recognizes and interprets the material. And it is by modifications to these patterns that he succeeds in retaining the characteristics of this material for use in the future. Insofar as the material can be characterized in ways which are already part of these long-term patterns, then no modifications are required for their retaining. These characteristics are already in the person's repertoire of activities and do not need to be acquired afresh. All that need be memorized are the novel characteristics of the material: the
unfamiliar relationships between parts which, in themselves, are already familiar.\textsuperscript{30}

\textbf{Decision Makers}. The H.I.P. model cannot operate unless there is a central processor or decision maker which controls the processing of information. Decisions must be made about selection in perception, selective filtering, selection for rehearsal, central programs, and recalling information from SM for feedback. G.A. Miller et. al. use cybernetic theory to explain the development of plans or programs for making memory decisions. For example, according to G.A. Miller, "Our fundamental concern, however, was to discover whether the cybernetic ideas have any relevance for psychology."\textsuperscript{31}

Using Cybernetic Theory G.A. Miller developed an explanation of the decision making (or control) process for the H.I.P. model. He uses F.C. Bartlett's (1932) concept of schema and E.C. Tolman's (1948) concept of cognitive maps to explain the process of decision making or control. But, he extends their concepts by providing a specific psychological paradigm for explaining the transition from plan to action. The schema are explained by the negative feedback loop of cybernetics or the "cybernetic hypotheses."

The interpretation toward which the argument moves is one that has been called the 'cybernetic hypotheses,' namely, that the fundamental building block of the nervous system is the feedback loop.\textsuperscript{32}

The system or organism has a program or \textit{plan} for making decisions or controlling its actions. Miller describes
A plan as:

A Plan is any hierarchical process in the organism that can control the order in which a sequence of operations is to be performed.

A Plan is, for an organism, essentially the same as a program for a computer, especially if the program has the sort of hierarchical character described above.33

TOTE. The plan is a set of instructions. The system implements the first step, completes that step and then proceeds to the next step. The system continues to run through the set of instructions until a "stop" order is given. The steps are arranged in a hierarchy of levels. Control is exercised through a decision making unit which G.A. Miller calls the Test-Operate-Test-Exit unit (TOTE). He diagrams this fundamental control unit in Figure 6:

```
Test
(Congruity)

(Incongruity)

Operate

The TOTE unit
```

Figure 6. TOTE.
The TOTE is a feedback loop which implements plans or programs by testing actual behavior with the comparison signal (related to the organism's "image"). The system adjusts its behavior until the error or incongruity is eliminated. G.A. Miller describes this operation:

The action is initiated by an 'incongruity' between the state of the organism and the state that is being tested for, and the action persists until the incongruity (i.e., the proximal stimulus) is removed. The general pattern of reflex action, therefore, is to test the input energies against some criteria established in the organism, to respond if the result of the test is to show an incongruity, and to continue to respond until the incongruity vanishes, at which time the reflex is terminated. Thus, there is 'feedback' from the result of the action to the testing phase, and we are confronted by a recursive loop.35

The system responds to incoming stimuli by using a plan for dealing with the incoming stimuli. The comparison signal in the TOTE is a part of the system's organized knowledge about itself and its world. The system has previously organized information for processing. The system retains this information in its memory system. The system processes and organizes incoming information on the basis of previously organized information, which constitutes the system's "image" or comparison signal.

While TOTE units can control simple actions, they can also control other TOTE units. When decision making concerns simple actions, G.A. Miller calls them tactical units. These deal with behaviors at the lower level of the
behavioral hierarchy. TOTE units which control other TOTE units represent higher level units. G.A. Miller calls these strategic units. One higher level TOTE or feedback loop can control several lower level feedback loops or TOTES. This explanation is the basis for distinguishing between strategy and tactics. TOTE units are stored programs for decision making. TOTE's organize information by making selection decisions. The system acquires new information which becomes a part of the system's "image" or memory schemata. Information is acquired and organized by TOTE units, which use the system's image as a comparison signal. The system organizes information in terms of the previous organization patterns contained in the system's memory schemata or image.

Long Term Memory. Information retention or storage is the second fundamental subprocess of the Broadbent model. Within the framework of his model, information retention is concerned with long term memory (LTM). If information is not processed; it is lost. If information is processed into short term memory (STM), it is available for a very limited amount of time, a few seconds at the most. If information is to affect future behavior over a time frame of minutes or years, it must enter the LTM or it is lost. If the information is not stored, it cannot be retrieved.
The commonly accepted position on the capacity of the LTM is that it has no known limit. The central processor is limited by its ability to organize and transfer information from the STM to the LTM. Apparently, the LTM is capable of storing all the information which is transferred from the STM "buffer." In addition to unlimited capacity, the LTM seems to be able to retain information for years without loss. Research indicates that information is stored indefinitely once it is properly processed by the STM buffer. The issue of forgetting is concerned with limited retrieval, not limited storage capacity in the LTM store. Information is lost because it is not processed or not selected. Information is also lost because it is not retrievable. But, information does not seem to be lost because it "decays" in storage.

Decay or Interference. Traditional research on forgetting centered upon the question of decay or interference. Decay theory holds that information is lost due to the passage of time. Interference theory holds that information is lost due to the intrusion of new events. Pure decay theory has not been especially influential. A test for decay as a function of time per se would require a time interval in which no additional experiences or additional psychological processes were experienced. The dynamic nature of cognition makes such a test nearly
Impossible. Research indicates that information is contained in LTM for unlimited time periods. There is often recall of details after years have passed (Penfield, 1963).

Retrieved information is not the same as it was at acquisition. There are omissions, additions, and distortions. But, decay is not a widely accepted explanation. These distortions are usually attributed to interference and inadequate retrieval processes. New items can interfere with the associate links which make information available for retrieval. Two primary forms of interference have been identified: proactive, where items learned earlier compete with items learned later, or retroactive, where items learned later compete with items learned earlier. Interference disrupts the organization and associative links which are established in the acquisition phase. The interruption of this organizational pattern has an affect on the success of the retrieval phase. Forgetting seems to be the result of an inability to recall, not an inability to retain.

Retrieval. Researchers generally agree that the retrieval subprocess is the crucial process in determining what information is available to the system over time. Past information affects the system only if it is retrieved and fed-back to the central processor. The effort expended in acquisition and organization is related to a system's
ability to recall information. G.A. Miller supports this analysis:

Observations such as these suggest that it is not storage, but retrieval, that is the real bottleneck in verbal learning. Building the connections seems to be far simpler than finding them later. A new association leading from A to B becomes merely one of many associations leading from A to something else. The time and effort that goes into a job of memorization is devoted to ensuring that there will be some way to get access to the particular association we want when the time goes to revive it.36

Retrieval involves at least two phases: location and retrieval for use. Location of information is based upon search procedures. The acquisition phase is crucial to the ability of the system to locate information for recall. Organization and association transform information so that it is available for recall. Norman suggests:

Elaborate rehearsal strategies presumably guide the storage process in such a way as to make later retrieval easier. What is done at the time of learning probably is a critical determinant of what will later be retrievable. Thompson and Tulving (1970) suggested that memory retrieval is entirely determined by what happens at storage. They argued that no cue, however strongly associated with the item to be remembered, can be effective unless the to-be-remembered item is specifically encoded with respect to that cue at the time of storage.37

Norman also suggests that we have plans for retrieving. He uses G.A. Miller's analysis. Systems develop plans, rules, and techniques which lead to retrieval. Rehearsal involves learning a plan for recalling information. Mnemonic techniques are examples of retrieval plans. Norman observes:
The power of mnemonic systems may be the result of a very simple principle: they reduce long, unrelated strings of material into short, related lists. Mnemonic systems provide us with the rules and techniques for shortening the sequence that is to be learned and finding meaning, even where there appears to be none.\textsuperscript{38}

Reconstruction. Bartlett suggested the concept of reconstructing rather than reproducing memories. Recall is based upon the plans for acquiring information and the context in which that information is acquired. As Norman states:

Bartlett proposed that we remember by organizing things within the framework of our experience. Remembering is viewed more as a process of reconstruction than as a recollection. As a result, our organizational scheme relies heavily on the integration of present experience with that of the past. Sometimes we find it difficult to reconcile the two, and as a result, we often remember what we expected to perceive, rather than that which we actually did perceive....According to Bartlett, we do not remember by activating some fixed trace of memory image. Rather we re-activate a whole mass of images, we energize the relevant schemas, and we re-create anew the event we are attempting to revive. But in this method, we may err by creating too much, for we may recall what usually was or what ought to have been instead of what really was.\textsuperscript{39}

Implications of the H.I.P. Model

The H.I.P. paradigm has led to a great deal of information about the psychological memory process. Broadbent's filter model was replaced by other alternative models. Broadbent's model was an early selection model which was replaced by Treisman's selection model. Deutsch and Norman developed a late selection model. All of these models
are related to the H.I.P. paradigm. Several of the assumptions of these models have been called into question. Some of these questions will be considered in the section on G.S.T. models of memory.

The cybernetic and H.I.P. models provide useful concepts. The H.I.P. models provide a structural and functional analysis of memory. The following statements represent some of the important conclusions developed by H.I.P. research. They are:

1) Memory is an essential subprocess in the living systems.

2) Information is transformed as it is processed. The three basic transformations are: conservation, reduction, and creation.

3) Information is processed by a single channel with limited capacity.

4) Information is processed in sequence.

5) Memory is one aspect of a series of interrelated processes including perception, attention, decision maker or central processor and memory.

6) Each process is carried out by a structural mechanism.

7) There are at least two crucial memory mechanisms: short term memory and long term memory.

8) The three phases of memory are: acquisition, retention, and retrieval.

9) Information must be processed through all three phases if past experience is to have an effect on future behavior.

10) Information is acquired only if it is selected by the attention mechanism.
11) Information is retained only if it is processed in the rehearsal buffer of the short term memory store.

12) Rehearsal extends the time which can be used for organizing the information.

13) Associative links are established in the organizing process.

14) Chunking, coding, and recoding are forms of organization. Verbal categories are the most common form of chunking in humans.

15) There must be a central processor or decision maker which controls the memory process.

16) G.A. Miller's concept of TOTES, plans, and schemata are an explanation of the central processor.

17) Long term memory is limited by the system's ability to locate and retrieve information. There are no known limits on retention of information which has been processed into the LTM.

18) Retrieval is related to the organization of information during the acquisition phase.

19) Retrieval is reconstructive rather than reproductive.

These 19 concepts will provide a useful framework for evaluating organizational memory. But, they must be considered in terms of the cybernetic assumptions upon which they are based. The analysis is fundamentally deterministic. It emphasizes structural and functional explanations. There is no adequate explanation of the creative process or dynamic nature of memory. There is a mechanistic bias with its emphasis upon structural mechanisms instead of creative process. The analysis of creative or self-determined behavior is inadequate.
A General Systems Theory of Memory

General Systems Theory (G.S.T.) emphasizes creative processes. G.S.T. deemphasizes predetermined reactions. The emphasis is upon active determination of outcomes, not past determination. Bertalanffy does not emphasize the role of past behavior. Memory and retention are generally not central concepts in the G.S.T. formulation.

The best way to understand the contrast between G.S.T. and cybernetic theory is to reconsider the concepts of equilibrium and equifinality. Cybernetic theory adopts the concept of a closed system, i.e., final conditions are determined by the initial conditions. The concept of equilibrium leads to an emphasis upon past conditions determining the present and final conditions. Memory is also an essential component of the negative feedback control loop.

In contrast, Bertalanffy adopts the open system concept of equifinality, i.e., final conditions (or "goals") may be reached from different initial conditions and in different pathways in organismic processes. Bertalanffy emphasizes dynamic action and creative process. The system is mutually causal. The system is active and helps determine its own behavior within imposed boundaries or constraints. Bertalanffy's analysis tends to de-emphasize the importance of past conditions and memory, but it does
not deny their relevance. As Bertalanffy states:

A problem not here considered is the dependence of a system not only on actual conditions, but also on past conditions and the course taken in the past. These are the phenomena known as 'after-effect,' 'hereditary,' ... Taking dependence on the past into consideration, our equations would become integro-differential equations as discussed by Volterra cf. D'Ancona and Donnan (1937).40

Bertalanffy does recognize the influence of past conditions.

An Analysis of Weick's Evolution Model

Karl Weick develops a G.S.T. of organizations which has a fuller development of the concept of the retention process. Weick's formulation is not entirely consistent with Bertalanffy's. In fact, in some ways it is closer to the cybernetic model. Bantz and Smith (1977) have indicated this similarity. They comment: "Its form is similar to the cybernetic model used by other organizational theorists."41 Weick's model is at odds with his overall perspective. The model is based upon a cybernetic formulation, but his perspective is more consistent with G.S.T. According to Bantz and Smith:

His [Weick's] description of organizing is Whiteheadian. But what of the model he offers? Weick has created a linear, sequential model where information must proceed step by step from enactment to selection to retention. Weick models sequential subprocesses: assembly rules, behavior cycles, and equivocality removed. This sequential, time-bound approach denies the notion of process (II) where there is no beginning, middle, end or 'fixed sequence of events.' Further, Weick introduces unidirectional causality as enactment affects selection and selection affects retention. Such non-mutual causation is the Newtonian fashion.42
This mixing of formulations is common in the literature, but it leads to contradictory conclusions if it goes unrecognized.

Weick's formulation is relevant because it represents the most successful attempt to date at developing a G.S.T. perspective of organizational communication. Weick's formulation of the retention (or memory) stage is based upon a dynamic analysis. Weick's model is an evolutionary model. The model conceives of organizations as a series of processes based upon patterns (or cycles) of interlocked behaviors. The process of organizing is essentially information processing. Information processing involves communication and, therefore, organizing involves communicating.

Evolution is based upon three processes: variation (or enactment), selection and retention. The three processes share three subprocesses: assembly rules, selection of cycles and removal of equivocality. The processes are accomplished by patterns of interlocked behaviors. Weick's diagram (Figure 7) illustrates this.

Weick characterizes retention as a dynamic process. Unfortunately, Weick does not seem to develop the implications of his perspective. He only emphasizes collective group action in the selection process. He characterizes the enactment, retention, and choice processes as being
Figure 7. The Organizing Model: Weick
determined by individual actors. This might represent a regression to psychological theories. Weick's perspective is based upon creative process, but his model reverts to the psychology of individual actors.

Bantz and Smith's Modification of Weick's Model. Bantz and Smith have observed that Weick "does not outline the retention process in sufficient detail." The observation about inadequate development of the retention process is correct. But Bantz and Smith propose a modification to the model which would emphasize individual action and de-emphasize the role of process contained in the concept of interlocked behaviors.

Weick's emphasis on the interpersonal, especially on double interacts, does not fit well with his argument that enactment is essentially 'conditioned' intrapersonally by individuals' interpretations of past actions. This contradiction stems from the combining of the individual attentional phenomenon of retrospective meaning and the group aspect of 'doing, acting, performing.' Weick lodges both activities in the enactment process. To deal with this contradiction, not only in the enactment process but also in the selection and retention processes, we have modified the model as indicated in Figure 2. By separating the individual's attentional activity from the group 'doing' activity, the confusion in Weick's discussion is minimized....Although he (Weick) alludes to memory, he does not fully consider the fact that human memory, not observable behavior, constitutes the retention process in many organizing situations.45

Bantz and Smith's modification includes emphasizing individual actions by making attention an individual process. Their model is diagrammed in Figure 8:
The emphasis would shift from group interaction to individual actors. This contradicts the process emphasis. It also diminishes the understanding of communication behavior within the organization. It suggests that individual behavior, not interactive behavior, be studied.

Super-Individual or Individual Process? Bantz and Smith compound a problem which already exists in Weick's interpretation. Weick links enactment, selection and retention sequentially. These processes are then linked by two negative feedback loops or what Weick calls choice points. According to Weick, individuals make the choices. He states:
Though the causal relationships among processes are usually direct, there are two exceptions. The relationships from retention to selection and from retention to enactment are under the control of the actors in the system.\textsuperscript{47}

Weick maintains that individuals make the choice about the use of retained information. This contradicts his earlier position that control is exercised by relationships, not people. "People are the medium through which these relationships are made actual. But in the end it is the relationships, not the people, that constitute the control network."\textsuperscript{48}

Weick also attributes the attention of the enactment process to individual actors. He describes the relationship of the actors to their enacted environment:

The informational environment on which processes operate is an enacted environment that is based on retrospective interpretations of actions already completed. These actions are partially under the control of past knowledge and partially under the control of external events. However, only those portions of the environment exist which are constituted by the individual through retrospective attentional process. It is in this sense that members of organizations actually create the environment to which they then adapt. It is actors and actors alone who separate out for closer attention portions of an ongoing flow of experience.\textsuperscript{49}

Weich emphasizes the role of the individual in enactment retention and control or feedback choices.

He does not emphasize collective action until information reaches the selection process.
Another crucial point is implied in the discussion. Up until the information reaches the selection process, it is pragmatically conditioned by the interests of the individual actor. His interests, and his interests alone, determine the meaning. But when this information is passed along to the selection process, collective rather than individual pragmatics control the establishment of meaning....

As a final point, it has been noted that the selection process is analogous to a decision center in organizations. This means that selection is the hub into which inputs are fed from diverse sets of actors.50

It is in his description of the selection process that Weick's model successfully portrays a dynamic interaction. But, Weick has portrayed enactment, attention, choice, and retention in terms of the individual. Yet, attention in the organization is a collective action. The selection process is an attention process, although Weick does not appear to recognize it as such.

Weick's perspective is Whiteheadian. The model of the selection process helps to preserve this orientation. But, the model seems to abandon this perspective when it uses individual actions to explain enactment, attention, choice, and retention.

The H.I.P. Model and the Notion of Process

Cognitive psychology and the H.I.P. research have been influenced by the notion of process. This has led to a reassessment of many of the earlier perspectives outlined in the section on cybernetic memory models (cf. p. 196). Some cognitive psychologists have questioned
the structural emphasis of the early H.I.P. models. This has led them to reject many of the conclusions of the earlier models. These researchers have emphasized the processes of memory and de-emphasized the structural components or mechanisms. The structural model is replaced by the concept of depth of processing (Craik and Lockhart, 1972; Craik and Tulving, 1975). The depth of processing model is based upon the earlier structural models which postulated that perceptual analysis involves a hierarchy of levels (e.g., Triesman, 1964). The depth of processing model emphasizes the process of encoding. Information is encoded at different levels. The more semantic (meaningful) processing that takes place, the "deeper" the level of encoding. Low level processing deals with sensory domains. Consideration of meaning results in better memory performance (Hyde, 1973; Walsh and Jenkins, 1973). The elaboration of the encoding process at any level is called "the spread of processing."

The process theories of H.I.P. re-evaluate many of the structural notions. For example:

1. Sequential processing is replaced by the notion of level processing. Processing may begin at any level (Lockhart, Craik, Jacoby, 1976).

2. Memory stores (STM, LTM, or PM, SM) are replaced by the concept of a single memory store.

3. Rehearsal is no longer needed in a single store theory. Cognitive activity is involved in semantic processing, not rehearsal.
4. The emphasis on structure is replaced by an emphasis upon activity.

5. Mechanistic associative links are replaced by semantic or meaningful linkages.

6. The plan or TOTE is replaced by semantic memory of rules, principles and facts (meta-memory) (Tulving, 1972).

7. Memory is not just dependent upon memory trace. The environment or context in which the memory is processed is crucial (Normal and Bobrow, 1975).

The cognitive psychological theory of memory is placing more emphasis on process and less emphasis on structure. The cybernetic assumptions emphasized structural elements, but recent research has indicated the need for considering process. It is becoming increasingly clearer that there is a need to explain the activity of memory, not the mechanisms.

A Concept of Organizational Memory

The concept of organizational memory can be viewed from a variety of theoretical frameworks. Memory has been defined in terms of Whitehead's notion of process. Organizations are systems in which the components are processes. Memory can be posited as an essential process of organization.

Memory Defined

What is memory? Generally, memory is defined as learning, retention, recall, and cognition of past information, events, behavior, or experience. This concept of memory comes from psychology.
Yet, most books on memory do not begin with definitions. The authors assume that such simple definitions are inadequate. Rather, the book is the author's answer to 'what is memory?'

Memory is not a single process, but a series of complex processes that are just beginning to be understood on the individual, cognitive level. The individual memory process has some obvious similarities to the organizational memory process. But, they also have obvious differences.

The extension of the concepts of memory into the domain of organizational systems should not be a relabeling of individual psychological concepts. The concepts of retention and recall are analyzed, not the concept of psychological memory.

Psychology has contributed to the structural-functional implication that memory as a static object or thing. The implication suggests memory exists as a part of the brain; thus, it is an objective thing. However, we should refer to the process of memorizing instead of "the memory." Memory is the process by which past experiences affect present and future experience. Krippendorff summarizes Ashby's general definition of memory by writing:

Memory, he [Ashby] argues, becomes manifest whenever the behavior of a system is influenced by events that lie sometime back in the past, and information about them must have therefore been retained within the system in some way.
Ashby's definition of memory is a concept invoked by an external observer to explain and to predict the system's behavior. He further states:

If a determinate system is only partly observable, and thereby becomes (for that observer) not predictable, the observer may be able to restore predictability by taking the system's past history into account, i.e., by assuming the existence within it of some form of 'memory'....Thus to invoke 'memory' in a system as an explanation of its behavior is equivalent to declaring that one cannot observe the system completely. The properties of 'memory' are not those of the simple 'thing' but the more subtle 'coding.'

Memory represents a conceptual framework for explaining systems which are too complex for deterministic explanations.

The failure of purely deterministic explanations indicates that there is a need to extend explanations beyond past, present explanations to teleological or future oriented explanations. Ashby refers to this as the concept of "emergent qualities." The present and past cannot account for or predict such emergent properties. The notion is related to Bertalanffy's concept that the whole is not equal to the sum of its parts:

The meaning of the somewhat mystical expression, 'the whole is more than the sum of parts' is simply that constitutive characteristics are not explainable from the characteristics of isolated parts. The characteristics of the complex, therefore, compared to those of the elements, appear as 'new' or 'emergent.'

The whole system is equipotential and equifinal. The system's complexity is governed by equifinality and
teleology. Equifinality and equipotentiality provide an additional frame of reference for explaining organizations.

**Past, Present and Future.** Three distinct theoretical frames of reference provide three distinct explanations of systems. First, the deterministic explanation uses cause and effect analysis. It attempts to explain the system in terms of the present. Ashby, however, has indicated the need to extend this kind of explanation. A second explanation is a reference to the system's past. The system's history or memory can provide an added explanatory framework. Bertalanffy adds a third explanation; it is equifinality. The system's equipotentiality deals with the system's future. Bertalanffy feels that G.S.T. offers explanations which are needed, but are excluded by Ashby and Cybernetics. Bertalanffy states:

Ashby's contention that 'no machine can be self-organizing,' more explicitly, that the 'change cannot be ascribed to any cause in the set S' but 'must come from some outside agent, an input' amounts to exclusion of self-differentiating systems. The reason that such systems are not permitted as 'Ashby machines' is patent. Self-differentiating systems that evolve toward higher complexity (decreasing entropy) are, for thermodynamic reasons, possible only as open systems....

**Social Memory**

Klaus Krippendorff uses Ashby's definition of memory to define social memory. Organizational memory is a form of social memory. Krippendorff's analysis points to the weaknesses of viewing social memory in terms of
individuals. He writes:

Notwithstanding the motivation for and the consequences of storing information individually, the process of memorizing past information from individual storage is essentially governed by the psychological laws of the human organism, not by social considerations.... But social consequences of this kind do not themselves constitute memory.\textsuperscript{55}

Krippendorff continues his discussion by defining social memory.

I want to include as explanations for the memory of a system the peculiar symbiosis between men and machines, the social conventions that place individuals into social structures, and, above all, the social processes of communication. These are all processes that go beyond the scope of the individual or of man's creations and are super-individual character. I would say that a system possesses social memory if its history-determined behavior can be explained neither by the psychological processes of its human constituents nor by the technological processes of the machines being used, but by reference to the underlying super-individual processes.\textsuperscript{56}

\textbf{Super-Individual Process.} Krippendorff also rejects functional explanations. He states:

Informally, we are likely to speak of an organism as having a 'memory' whenever we find functional reasons for that organism to be incompletely observable and whenever the 'memorized' information is physically or chemically localizable at least in principle. But, in using this notion, we are neither able to prevent imaginary functional reasons to cover observational inadequacies nor able to go beyond the biological concepts which might not be appropriate in explaining social phenomena of memory.\textsuperscript{57}

Krippendorff has indicated the essence of a process definition of organizational memory. The social processes of communication go beyond the scope of the individual; rather, they include the super-individual processes.
But, Krippendorff does not follow the process orientation in his methodology. He reverts to a structural analysis of process. For example:

...we seek explanations of the quality 'possession of memory' in the very structure of the system to which this can be attributed....Social memory explains history-determined behavior by reference to structural features of society.\(^{58}\)

This statement by Krippendorff illustrates his definition of process in terms of structure. His earlier statement noted below is much more relevant and should have been adopted in his model. That statement is:

Social phenomena too are often seen as determined not by the present conditions alone but also by 'historic forces,' which is another way of saying that past events shape through some existing mechanism what is observable at present. It is the underlying process by which traces of past events are maintained and brought to bear on the behavior of a system which I would consider as constituting its memory.\(^{59}\)

Memory is a process. It is so defined in this analysis.

Organizational Memory

Organizational memory is an example of "social memory." Organizational memory is a form of explanation of behavior with reference to events in the past which are maintained and brought to bear on the present and future behavior of the system. Memory can be viewed as a relationship between the external observer and the system. The observer's inability to obtain full information about a system's present condition results in an explanation evoking "memory" in a system. Ashby states:
Thus the possession of 'memory' is not a wholly objective property of a system—it is a relation between a system and an observer; and the property will alter with variations in the channel of communication between them. Thus to invoke 'memory' in a system as an explanation of its behavior is equivalent to declaring that one cannot observe the system completely. The properties of 'memory' are not those of the simple 'thing' but the more subtle 'coding.'

Social or organizational memory is not "organic" or artificial "machine memories." The organic and technical processes are explained by the psychologist and the engineer. But their explanations are not equivalent to the explanations given by social memory processes. If an organizational system's behavior can neither be explained by psychological processes nor technological processes, then it should be explained by the super-individual processes constituting a system's memory.

Organizational or systems' memories are constituted by the processes which acquire, maintain, and retrieve information. Such processes are used in influencing the system's behavior. Organizational memory can be defined in terms of the processes which acquire, maintain, and retrieve past information for use in influencing present behavior. These processes are organizational memory. The interlocked behaviors, or social processes of communication behavior, form a system of processes that are organizational memory.

Organizational memory is a process which is defined by the interlocked behaviors of organizational communication.
Organizational memory has the properties of process as outlined by Whitehead. It is the pattern of dynamic activity which constitutes organizational memory. The physical objects associated with these processes provide physical structure, but it is process and not structure which constitutes organizational memory.

The behavioral events, patterns, and how they change over time become the explanation of process. Events in process define organizational memory. The "becoming" of memory constitutes the process. Memory is not a physical "thing," but a dynamic "becoming" of process. The communication patterns constituting the social process are the essence of organizational memory. The process is more than the acts or behaviors of individuals. Process is super-individual. It is the patterning of behavior in the system. Process is not explained by the behavior of individuals; rather, it is explained by the collective actions of the whole system. The interlocked behavioral patterns which acquire, maintain, and retrieve information are the social processes which determine organizational memory. The structuring of the dynamic events defines social process. The process of organizational memory has no structure apart from the dynamic interaction of events. When process ceases, there is no identifiable
organizational memory. Organizational memory is the process; it is not the physical structure. Mechanistic explanations draw attention to the physical structure instead of the creative process.
Footnotes

1 Skinner, *Beyond Freedom and Dignity*, pp. 186-7. See also *About Behaviorism*, p. 84.


6 Wiener, *op. cit.*, pp. 55, 57.


8 J.G. Miller, *op. cit.*, p. 66.


21 Fitts and Posner, op. cit., p. 42.

22 Ibid., pp. 135, 136.


26 Ibid., p. 106.

27 Ibid., p. 75.


33 Ibid., p. 16.


36 Ibid., p. 137.

37 Norman, op. cit., p. 127.

38 Ibid., p. 153.

39 Ibid., pp. 223, 224.

40 Bertalanffy, op. cit., pp. 133, 134.

Ibid., p. 182.

Weick, op. cit., p. 93.

Bantz, op. cit., p. 173.

Ibid., pp. 173, 174.

Ibid., p. 175.

Weick, op. cit., p. 92.

Ibid., p. 37.

Ibid., p. 91.

Ibid., p. 70.


Ashby, op. cit., pp. 115, 117.

Bertalanffy, op. cit., p. 55.

Ibid., p. 97.

Krippendorff, op. cit., p. 16.

Ibid., p. 16.

Ibid., p. 16.

Ibid., p. 17.

Ibid., p. 16.

CHAPTER V
MEMORIZING PROCESS AND CONCLUSIONS

Concepts

This study has advocated that memory is based upon process. Memory is a relationship, not an object or a thing. It is a framework for explaining a system's past, present, and future characteristics. The memory process is explained by the following concepts: information, interpretation, meaning, attention, selection, coding, enactment, transformation, time, relevance, teleology, morphogenesis, and creativity.

The process description supplants structural-functional descriptions because processes are dynamic. Organizations are explained by the ways in which their processes are continuously executed in time.

Memory is a set of continuously executed processes using media, people, and objects, which are at hand. Memory is represented by the relationships of the available props and people as they engage in the memory process. These patterned relationships are the organization's memory, and dynamic activity explains how past conditions affect present and future behavior.
Memory is not static. Past conditions do not affect present conditions directly. The information in the memory process is transformed. Organizational memory transforms information obtained from past experience. The memory process organizes information; it can elaborate, reduce, modify, or maintain information. Memory is a combination of past experiences and the subprocesses by which that information is acquired, maintained, and retrieved.

The process view rejects the strictly deterministic perspective. Likewise, memory should not be explained only in terms of structure, or a sequence of cause-effect relationships. Memory should be explained in terms of a set of dynamic, complex relationships. The S-R interpretation of memory is replaced with a process interpretation. Decisions are not entirely explained by the negative feedback loop and designed in goals. Rather, decisions are explained creatively. Self-determination, causa sui, equifinality, and organized complexity explain decisions better than negative feedback loops, S-R learning, and equilibrium.

Creative teleology supplants the functional teleology of cybernetics and "designed in" aims. Systems are self-directed by their complex potential. They are not entirely determined by designers and past conditions. Choice and selection are decided by the complex characteristics and
potentiality of the system.

The patterns and relationships of the memory subprocesses, along with the equipotentiality of the system, help make decisions and choices which account for the system's behavior over time.

Information

This study has used the information processing analogy as a perspective for viewing organizational communication. Organizational processes transform information. But, how is information defined? James Miller equates information, formal patterning, order, and organization.

Information is the negative of uncertainty. It is not accidental that the word 'form' appears in 'information,' since information is the amount of formal patterning or complexity in any system....It is possible to understand information in general as whatever is put in form or in order....Information expresses the organization of a system....It does not concern itself with the matter of that system but with the form,...

Information is characterized by form, pattern, and order. The opposite of information is entropy. Entropy is defined as disorder, disorganization, lack of patterning, or randomness of organization.

Interpretation and Code

Communication involves the transmission of information from a source to a receiver. But, information is not the same for the receiver. The degree of organization is a matter of interpretation. Order to a source
might represent disorder to a receiver. Source information is receiver information only if it relieves uncertainty for the receiver. The source may impose form or order. But, if the receiver cannot interpret the pattern in terms of order or certainty, it does not represent information to the receiver. Communication is dependent upon an agreement between the source and the receiver. A common "language" or code is a prerequisite of communication between source and receiver. The common code allows the source and receiver to share a perception of form and organization. A code is a commonly accepted system of rules.

**Meaning**

The receiver must be able to interpret the source's code if a message is to be perceived as information. But, another more fundamental interpretation is involved in communication. A second concept must be introduced. Meaning is defined by Schutz in terms of a reflective glance—an act of attention to a selected portion of the past.

Schutz states:

Meaning as has been shown elsewhere, is not a quality inherent in certain experiences emerging within our stream of consciousness but the result of an interpretation of a past experience looked at from the present Now with a reflective attitude. As long as I live in my acts, directed toward the objects of these acts, the acts do not have any meaning. They become meaningful if I grasp them as well-circumscribed experiences of the past and, therefore, in retrospection. Only experiences which can be recollected beyond their actuality and which can be
questioned about their constitution are, therefore, subjectively meaningful.²

Perceived information or order must be interpreted in order to be meaningful.

Information can have a great influence on the system which processes it. But, this is the impact of meaning in the pattern and not the information itself. For example,

All such relationships involve observation of a pattern in space and/or time and then an interpretation by the observer of the meaning of that pattern.³

Information patterns can be transmitted in both space and/or time. Yet, information is not meaningful if it is not observed and processed by an interpreter.

**Processing and Transformation.** Information processing involves "the change of information from one state to another or its movement from one point to another...."⁴ If the form or pattern remains constant during these changes, information is not created nor lost.

Information can be transformed. The code containing information can be recoded. If the form or pattern remains constant, it is an information maintaining transformation. If additional patterning or organization occurs in recoding, it is an additive transformation. If there is a loss of organization or distortion of the pattern, it is a reductive transformation. The medium or marker which carries the information can also change. This is a second form of transformation called recoding. The
pattern or organization can again be maintained, added to, or destroyed. Any addition, deletion, or reconstitution of information is an information transformation process.

**Boundaries and Environments**

Organizations have been viewed as systems within suprasystems and composed of subsystems. These concepts imply that there is a distinction between systems, subsystems, and suprasystems. The distinction between these concepts is centered around the notion of boundaries, which limit each level of analysis. The notion of a hierarchy of system levels is an arbitrary distinction which is a matter of interpretation. Hall and Fagen clarify this statement:

In a sense, a system together with its environment makes up the universe of all things of interest in a given context. Subdivision of this universe into two sets, system and environment, can be done in many ways which are in fact quite arbitrary. Ultimately, it depends on the intentions of the one who is studying the particular universe as to which of the possible configurations of objects is to be taken as the system.5

The boundaries of a system are thus defined by the interpreter. The distinction between a system and suprasystem, i.e., environment, is self defined. It is a matter of interpretation; the interpretation is relative to the system of relevances used by the interpreter. Weick has indicated that organizations define or interpret their own environment. Weick calls this concept the notion of
"enacted environment." The organization through the process of super-individual action enacts its own meaning for environment. Weick explains:

Rather than talking about adapting to an external environment, it may be more correct to argue that organizing consists of adapting to an enacted environment which is constituted by the actions of interdependent human actors.

The organization defines its own environment, but once defined the environment is real and meaningful to the organization. Enacted environments constantly change since the "definition of the situation" is in a constant process of change. Ohio State University would serve as an example. Various subsystems define the environment in terms of their own relevancies. The Psychology Department deals with the "outside world" in terms of its own interpretation of that world, and the total university system has its own interpretation of the outside world. The system's interpretation is a product of the actions of interdependent actors.

Super-Individual Processes

Interpretation is a super-individual process for an organization. Interlocked behavioral cycles or processes interpret information in organizations. An organization is constituted by process. This is the implication of the Katz and Kahn statement (cf. p. 75) that information processes and communication are the essence of an organization. The organization should be viewed in terms of collective
interrelated behaviors. Individual perceptions do not explain the interpretations of social organizations. Meaning, order, and information are interpreted by organizations in terms of collective interlocked behaviors. Meaning is found in a "set" of interlocked behaviors.

A collective structure exists when behaviors of two or more persons become interstructured and repetitive. The unit of analysis now becomes the interact or double interact and not the act.7

The interpretations of organizations are accomplished by collective interlocked behaviors. The attention processes of organizations are super-individual. Selection and control decisions are accomplished by interlocked behavioral patterns. The organization interprets and brings order to the world by interlocked behavioral processes.

To the extent that the roles are normatively defined, the unfolding interaction sequence reproduces a behavior which society has acquired a long time ago. It is unique not to each individual involved but to the combination of their roles, each bearing complementary role markings. The combination roles in interaction memorizes an interaction sequence and thus constitutes a social memory of super-individual information.8

The information coded by role patterns is meaningful to the organization, not the individual. The individual actors do not need to know how societies or organizations interpret their actions.

There is no need to assume that the information thereby retrieved must fit into any single individual's head. A society which employs such a mode of storing information in a certain domain can afford its members to be myopic in that domain, leaving intellectual facilities for other activities.9
Meaning is found in the sequence of interactions; not in individual actions.

The meaning of what A says to B cannot be decoded without considering the sequence of interactions that preceded it. This clearly exemplifies the effects of a social memory. Information is coded into a sequence of behaviors. The pattern of interlocked behaviors is an informational pattern. The information in the interlocked behaviors can be interpreted by any retriever that can "decode" or interpret the information. Meaning is always in terms of a specified interpreter.

Process Replaces the Spatial Orientation with a Temporal Orientation

An adequate theory of communication will explain structure, function and process. Structure, function and process are related to the concepts of space and time. Structure is usually defined as an ordered pattern of matter in space which remains constant in time. Function is usually defined as a causal relationship of structural components which are reversible in time. Process is a new conceptualization of structure and function within the perspective of the time dimension. Material form and linear time sequences are replaced by a dynamic concept of structure and function. Structure becomes a pattern of relationships in time, which are equifinal.
The structural-functional view of a bounded time and space are replaced by a process perspective emphasizing transactional processes which emerge over time. This "evolutionary" or "systems" orientation emphasizes the "becoming" of entities over time instead of material things existing in time and space. The focus is on emergence in time and not material existence in time and space. Emergence is equifinal and irreversible. Thus process is distinct from the Newtonian concepts of structure and function.

The blurring of distinctions between space and time—structure and function—in a process perspective is now complete. Behaviors are inherently transient and have no existence in space. The structure of a communication system, unlike a physical system, cannot be described in spatial terms....Since events serve to characterize the components of the system and events have existence only in time, the typical notion of structure as a physical spatial phenomenon is not applicable....If order...can mean order in time as well as order in space, then the hypothesis must be extended to include, the concept of complexity in time as well as complexity of form. 11

The emphasis upon the primary importance of the time dimension is one distinction between the process perspective of Whitehead and Bertalanffy and the structural-functional perspective of Newton. The Newtonian perspective defined structure in terms of spatial relationships. Entities were defined as things or objects which had material existence in space. Material objects are characterized by the cause-effect relationships of efficient causation. Understanding is measured by the ability to predict.
Functional relationships are also closely related to the spatial dimension in the Newtonian perspective. The "clockwork" is characterized by its material spatial structure. Functional movement is introduced but movement is within a spatial structural form. Structure generates function; function is determined by the spatial structural characteristics and the external designer. The introduction of movement requires the introduction of the fourth dimension, time. But the Newtonian concept of time is a restrictively view in the sense that functional movement is constrained by spatial structure. The movement of the pendulum is absolutely determined by the spatial form of the "clock." Time is "reversible" because the movement of the material components is determined by the material form which is characterized by repeated or redundant, predictable, movements. The "scientist" can explain movement by designating the material form of the entity and the cause-effect relations.

Organizations should be understood as processes emerging over time. The explanation of the organization's material form leads to a limited understanding of its emergence over time. The process view of organizations explains structure and function as processes of behavioral activity which emerge over time. If the activity ceases the organization ceases.
Complexity

The process perspective places its primary emphasis on the time dimension instead of the spatial dimension which is emphasized in the structural-functional Newtonian perspective. The concept of complexity will help distinguish the process perspective and the Newtonian perspective. Fisher (1977) gives an explanation of complexity in communication systems. Fisher quotes Rapoport and Horvath to explain the "continuum" of complexity.

Rapoport and Horvath discuss a continuum with varying degrees of complexity in which 'organized complexity' is bounded by the polar opposites of 'organized simplicity' and 'chaotic complexity': 'The organization of a system is simple if the system is a serial or an additive complex of components... a time-linear chain of events, each a determinate consequence of a preceding one....

At the other extreme is 'chaotic complexity' where the number of entities involved is so vast that the interactions can be described in terms of continuously distributed quantities or gradients, i.e., do not need to be specifically identified with regard to the individual entities.

'Organized complexity,' then, lies in the middle of this continuum--neither totally determinate and predictable nor totally random and unstructured. This concept of complexity is closely associated with the concepts of organization and order.

Information theory stipulates that redundancy is constraint of choices and constraint is structure. And structure is orderly organization--negentropy. The more redundancy or structure, the more stability is possessed by the system. Events, which are determinate, predictable and ordered by relationships of efficient causation (C-E), are simple
or non-complex. Events, which are indeterminate, random,
uncertain and unexplainable in terms of determinable cause-
effect relationships, are examples of chaotic complexity.
Events which are highly organized, patterned or ordered
are simple. Events which are unorganized, non-patterned
and disordered are complex. The middle of the continuum
represents events which balance order and disorder; Fisher
calls this organized complexity.

The criteria for designating and measuring complexity
is predictability. Predictable events are simple. Random
unpredictable events are complex. Fisher's concepts of
simplicity (order) and complexity (uncertainty) can lead
to unfortunate mechanistic implications. Fisher spends a
great deal of space in an attempt to avoid some of these
implications. Implied material form, and substance are
the most unfortunate mechanistic implications.

**Material Form.** Classical physics conceives of enti-
ties that are material things which endure in time. Mat-
erial forms have structure which exist in the spatial di-
mension. Matter occupies space and no two objects can
occupy the same space at the same time. Thus classical
physics conceives of entities that are related to each
other in terms of material actions and reactions. Actions
and reactions are explained in terms of the cause-effect
analysis of efficient causation. The assumption of material
existence assumes the spatial dimension is primary.

The mechanistic view of classical physics views both structure and function in terms of the material assumption about entities. The result is an emphasis upon the dimension in which "things" exist, the three dimensions of space. Mechanistic function assumes material structure. It is a functioning of material components. The "clock" is composed of material components or parts. The components are ordered in space, i.e., structured. The structure constrains or determines movement within spatial structure. The "pendulums" movement is determined by the clock's spatial structure. Movement assumes a fourth dimension; time. But, material form endures in time and determines change over time. The mechanistic system is closed and determinate. Initial conditions determine final conditions.

Mechanistic determinism assumes that given some antecedent event/condition or combination of events/conditions, then some prediction of some future event/condition is possible. In the mechanistic ideal, to know the present is to predict the future. Determinism, in the sense that the present determines the future, is the mechanistic ideal of 'process.' In other words, within the mechanistic ideal the concept of 'process' is little more than a temporal sequence of events within a closed system. The components are connected in space. Thus, the action-reaction relationships of efficient cause (C-E) determine the actions of the system.

B.F. Skinner's operant theory of behavior illustrates the mechanistic view. Behaviors are the structural
components of psychology and the goal is a functional explanation which predicts the movement of behaviors. Prediction is the criteria of success.

**A Process View of Complexity.** Complexity should be disassociated from the mechanistic concept of predictability and determinism. Complexity should be more closely associated with the time perspective of the process view of Whitehead. The analysis of entities should shift from the spatial emphasis of the mechanistic view to the time dimension of Whiteheadian process. The analysis shifts to relationships in time not material relationships in space. The critical implication of Whitehead's analysis of process is that the time dimension, not the spatial dimension, is primary.

How are order and complexity related in time? Order is a pattern or a sequence. Order can exist in all dimensions. There can be a spatial pattern. Order can also be generated from a spatial structure. Or, order can exist as a pattern in time. Spatial order can be found in any of the three dimensions of space; height, width, or depth. Order can also exist in any of the "dimensions" of time; past, present or future. Since time is the crucial dimension in a process analysis, it is important to examine relations of events in the past, present and future. But first, an extended concept of complexity is necessary.
Which system is more complex? A clock, a machine which generates random numbers or an organization like General Motors. If organization equals order or patterning then the clock is most ordered. But a new concept of organization would result in a different answer.

Whitehead's analysis of process would suggest a new concept of complexity and a new concept of organization. A definition of order and complexity should go beyond the mechanistic assumptions of spatial complexity and order. It should deal with the notions of temporal order and complexity. Whitehead, Shannon and Fisher suggest how this concept can be developed. The key notions are the potential for organization and the information which is generated by the system.

Earlier in this chapter information was defined as patterning, ordering, or organization. James Miller equated information and complexity, information is the amount of formal patterning or complexity in any system. It does not concern itself with the matter of that system but with the form (cf. 223). Note that the mechanistic notion of material form has been labeled less relevant. The mechanistic structural-functional notion of efficient cause also decreases in importance.

Miller's notion of patterning and complexity is in direct conflict with Fisher's notion of complexity. An extended concept of complexity and organization can resolve
this conflict. Miller's notion of complexity being defined by a pattern seems to be as inadequate as Fisher's notion of complexity as being defined by the level of uncertainty, randomness or disorder. The resolution comes with a definition of complexity in terms of both pattern (information) and lack of pattern (uncertainty).

**Two Notions Define Complexity.** Complexity is defined by the potential for disorder and the system's selection of order. Organizations vary in the dimensions of level of uncertainty and level of information. The most complex organizations have the highest level of information ordering or organization. But, the potential for order is directly related to the level of uncertainty which is dealt with by the system or organization. A sophisticated perception of the suprasystem or environment results in the perception of higher amounts of uncertainty. Complex organizations are capable of imposing order or creating information for very uncertain environments. A complex organization is an organization which brings a high level of order (information) to an environment with a high level of uncertainty.

Rocks, plants and men are systems which share a common environment. But man represents a more complex system than plants and plants represent a more complex system than rocks. Man as a system is capable of creating more
information (patterns) to deal with the environment because man registers a high level of uncertainty. The complexity of the human system is due to both the ability to register uncertainty (potential disorder) and the ability to create information (order). Evolution indicates that there is a need for a balance between registering uncertainty and creating order. Complex organizations need to register high levels of uncertainty and need to create large amounts of information. Information allows systems to survive environmental uncertainty. If a complex system registers low levels of uncertainty it creates low levels of information. This can be dangerous in uncertain environments.

**Information to a Source.** The concept of organizational complexity is closely related to Shannon's concept so that it distinguishes between levels of organizational complexity from a Whiteheadian process view. Shannon's notion, however, adopts the mechanistic, cybernetic assumptions of closed system: 1) uncertainty (the number of possible choices) is finite and measurable, thus the system is closed. 2) closed systems tend towards uncertainty, randomness, entropy or disorder. A process view of information should extend Shannon's mechanistic view.

Shannon's definition of information can be ambiguous. Shannon states that information is measured by entropy (uncertainty).
That information be measured by entropy is, after all, natural when we remember that information, in communication theory, is associated with the amount of freedom of choice we have in constructing messages. Thus for a communication source one can say, just as he would also say it of a thermodynamic ensemble, "This situation is highly organized, it is not characterized by a large degree of randomness or of choice—that is to say, the information (or the entropy) is low"...the entropy (or the information, or the freedom of choice of a certain information source.15

But why would J. Miller and deBeauregard state that information is the negative of uncertainty ("negentropy"). Or, Fisher's statement that Shannon's definition of information is expressed as pattern or redundancy?

Shannon and Weaver (1949). Information theory considers information a measurable quantity of uncertainty. This sense of information is central to the pragmatic perspective of human communication and is expressed as the amount of pattern, redundancy, or constraint (interchangeable terms) that is reflected in the ongoing sequence of communicative behaviors.16

Is information defined by uncertainty and entropy or by certainty, pattern, and negentropy? Is information entropic or negentropic? It is both. Information for a source is measured by entropy or the source's freedom of choice.

To be sure, this word information in communication theory relates not so much to what you do say, as to what you could say. The concept of information applies not to the individual messages (as the concept of meaning would), but rather to the situation as a whole, the unit information indicating that in this situation one has an amount of freedom of choice, in selecting a message, which it is convenient to regard as a standard or unit amount.17
Potential choice is more important than the actual selection. Stated in another way there is more information (pattern value) in a choice from a larger number of alternatives than a smaller number of alternatives.

There is another important way of increasing $H$, namely by increasing the number of cases. More accurately, if all choices are equally likely, the more choices there are, the larger $H$ will be. There is more 'information' if you select freely out of a set of fifty standard messages, than if you select freely out of a set of twenty-five.\(^{18}\)

**Information to a Receiver.** But the meaning of information shifts when the location shifts from the source to the destination and channel. The actual selection is what is received by the channel and destination, not the potential choices. There is a shirt in emphasis from "what could be said to what is said." At this point in the article information is redefined as the selected pattern and thus information is defined by the selected pattern or negentropy. Shannon's discussion of channel capacity clearly shows this shift in meaning.

The capacity of a channel is to be described in terms of its ability to transmit what is produced out of source of a given information....capacity measures not the number of symbols transmitted per second, but rather the amount of information transmitted per second, using bits per second as its unit.\(^{19}\)

**Potential Choice.** The greater the number of choices, the greater the uncertainty, then the greater the amount of information which is created by the selection process. The selection process imposes patterning or order upon a
disordered field of choices or alternatives. If organized complexity is to be measured by the amount of information that can be processed, then organizations that register high levels of uncertainty, i.e., organizations that recognize large numbers of alternatives, are potentially the most complex. Potential complexity becomes actual complexity only if organizations actually make selections, i.e., creates a patterning or ordering which creates information and reduces uncertainty. Systems which are unable to select or create information are destroyed by the uncertainty, i.e., they cease to be organized systems. Systems which reduce uncertainty by reducing alternatives fail to register uncertainty and therefore reduce their potential complexity.

Complex systems need to register many alternatives or choices and they must be able to make selections from the alternatives which they register. A process view of organizations must explain both alternatives and selection.

An important aspect of a process view of organizations is in the analysis of potential alternatives. Process analysis goes beyond an analysis of spatial alternatives and examines the more crucial temporal alternatives. A system which deals with spatial and temporal alternatives has a much greater potential complexity, i.e., potential for organization, than do systems which are bound by spatial
alternatives. Fisher makes an explicit statement of this point.

Temporal complexity involves a sequence of choices that increase in complexity over time. And as complexity increases, you will recall, the probability of expected occurrences also decreases....The longer the sequence of occurrences, the less probable any given sequence under random circumstances, that is, the greater complexity in time....the number of available choices increases remarkably over time. Though there are only two alternative choices available at the level of 'act,' the communicators have four available choices of interacts, eight choices of double interact sequences, and sixteen choices of triple interacts.20

The recognition of the concept of potential organization is at the heart of understanding of Whitehead's statement that "being is constituted by becoming." Whitehead is attempting to replace the Newtonian concepts of static material forms in space with the more complex notion of changing entities emerging in the temporal dimension.

**Alternatives in the Past, Present and Future.** Man with his perception of alternatives arising out of the past, present and future is potentially more complex than an animal which perceives only alternatives in the present.

Complex organizations or systems by definition deal with greater numbers of potential alternatives. Thus, understanding the temporal dimension of complex systems is important to understanding their complexity and organizational level. Potential complexity is greatly increased when events occur over time. Potential complexity is even
greater when events have a present, past and future temporal dimension.

The focus on the complexities of time is one of the most important contributions of the Whiteheadian notion of process. The notions of time adopted by G.S.T. and the process view are a key to distinguishing the cybernetic mechanistic view of spatial, material time, and the G.S.T. view of process time.

**Spatialized Time**

Complexity and organization are measured by two criteria; one, by the number of potential alternatives (or level of uncertainty) and second by the selections made among those alternatives (or the level of ordering, patterning or information). Systems and organizations which deal only with the material, spatial dimension of classical physics are less complex than organizations which deal with spatial and temporal dimensions. Whitehead's "process" view is distinct from the Newtonian view because it extends the notion of time. The classical Newtonian view of time is defined by classical physics. Fisher (1978) calls this physical time. Schutz (1964) calls it spatialized, objective, cosmic or outer time. The notion of spatial time retains the assumptions of physical time lead to several conclusions about time:

1. Time is defined in terms of things. Physical time is defined in terms of the sun and the physical rotation of the earth. It is a material, spatial time.
2. Things take space and no two things can occupy the same space at the same time. Time is defined in terms of spatial relations. There is a group of material components which stand in a spatial juxtaposition. Each material thing is isolated from the other components by space. Things coexist as points in space and time. The material relation of action-reaction and cause-effect explain relationships; not temporal passing. Relationships are defined by physical action not temporal action.

3. Things endure over time. Things remain unchanged. Jack of the "here and now" is the same Jack of 15 minutes ago. The rock of "here and now" is the same rock that existed 15 years ago. The spatial relation with other things has changes with time but the thing, "rock," endures.

4. Time is durational, things endure over periods of time.

   Time is thereby durational in the sense of 'how long' it takes to get from one point to another. We use such a blend of time-distance in our everyday vocabulary.

Mechanistic time uses the standard durations of day, hour, minute and second. These durations are determined by the space-time relation of the earth's rotation. Time is constant. Each day and each hour represents a constant period or duration. The movement from one point in space to a second point in space is at a constant speed. The speed of the earth's rotation is essentially constant and thus, time becomes constant.

5. Functional movement in space-time is defined by the material, spatial structure of the components. The "clock" consists of a group of isolated, co-existing components whose movement in space-time is defined by the spatial relations of cause and effect.

6. The purpose of the functional relationship is defined by an external designer who creates the spatial-temporal relationship. A machine or clock cannot create nor change spatial-temporal relationships. The "clock" must follow its determined "path."
7. Time cannot be manipulated nor controlled. Cause-effect relationships predetermine function and action. The "clock" cannot change its path, it cannot control its path, it cannot create an alternative path. The clock has no purpose of its own, it is controlled by the purpose of its external designer.

8. Time is sequential. There is a starting "point" on the "trip," a middle "point," and an ending "point."

9. The sequence sets up a chronological order which is unidirectional. It proceeds in a "direction."

A Process View of Time: Duree

Process time is dimensionless; a single unity of emergence. In a sense it is timeless from the spatio-temporal perspective. There is no chronological order, no sequence of spatial events, no beginning, middle or end, no length, no segmentation, no distinct periods, no direction, no repetition, no boundaries and thus no past, present and future. There is only the "here and now," the continuous flowing flux of experience. It is what Bergson and Schutz have called duree, the stream of experience, the inner stream of duration.

Let us begin by considering Bergson's distinction between living within the stream of experience and living within the world of space and time. Bergson contrasts the inner stream of duration, the duree—a continuous coming-to-be and passing-away-of heterogeneous qualities—with homogeneous time, which has been spatialized, quantified, and rendered discontinuous. In 'pure duration' there is no 'side-by-sidedness,' no mutual externality of parts, and no divisibility, but only a continuous flux, a stream of conscious states....I cannot distinguish between the Now and the Earlier, between the later Now and the Now that has just been, except that I know that
what has just been is different from what now is. For I experience my duration as a uni-directional, irreversible stream and find that between a moment ago and just now I have grown older. But I cannot become aware of this while still immersed in the stream. As long as my whole consciousness remains temporally uni-directional and irreversible, I am unaware either of my own growing older or of any difference between present and past. The very awareness of the stream of duration presupposes a turning-back against the stream, a special kind of attitude toward that stream, a 'reflection,' as we will call it....The awareness of the experience in the pure stream of duration is changed at every moment into remembered having-just-been-thus; it is the remembering which lifts the experience out of the irreversible stream of duration and thus modifies the awareness, making it a remembrance....The simple experience of living in the flow of duration goes forward in a uni-directional, irreversible movement, proceeding from manifold to manifold in a constant running-off process. Each phase of experience melts into the next without any sharp boundaries as it is being lived through.

Selection

The distinction between spatial-temporal time with its assumption of enduring material things and "process" time, i.e., the duree, leads to an analysis of the complex notion of selection. The notion of selection is a central notion to an information processing model of organizational complexity and organizational memory. Organizations face an environment which offers an infinite number of alternative or potential paths for the emergence of the system or organization. In the process of becoming the organization selects among potential constitutive elements those which result in the emergence or becoming of the organization. Choice or selection is represented by
ordering or patterning potential and a set pattern which represents the selected elements. The selected pattern can be represented as information. The greater the potential alternatives, the greater the potential for information, in the selected pattern.

Bergson's analysis of the problem choice is related to the confusion of inner duree and spatialized time. This is closely related to Whitehead's statement that Newton has confused what is "real" potentially with what is actual (cf. p. 20). For Whitehead the "actual" is that which has become, the particular existent of the "transition" (cf. p. 13), the determinate satisfaction of indeterminate process, the superject. The superject (existent) becomes a part of objective immortality (the past). But, the past "never really is" (cf. p. 18), since the becoming of the here and now, the continuous flux of process is what constitutes the entity. Process is characterized by what is "real potentially" not by what is "actual in attainment, the past."

**Bergson on Choice.** Bergson's analysis of choice is based upon a clarification of the confusion of inner time duree and spatial time. Choice is constituted by the potentialities of existence not by two alternative points in space which coexist within material space. Bergson explains choice in terms of the open potentialities of duree. Choice
is open within the potentials of nature, society and the historical situation of the organization. Bergson rejects the analysis of associationistic psychology. Associationistic psychology explains choice in terms of two possibilities conceived as if they were two coexisting point in space.

Thus the way of speaking of two tendencies or two directions is purely a metaphorical one: in reality there are neither two tendencies, nor two directions but just an ego which lives and develops by its very hesitations until the free action detaches itself from it like too ripe a fruit....Deliberation cannot be conceived as an oscillation in space; it consists rather in a dynamic process in which the ego as well as its motives are in a continuous stage of becoming.  

Organizations make choices with many potential paths or directions available. Decisions continuously emerge in time and new potentials emerge as the decision is being made. A decision in a military organization illustrates the multiple potentialities of military decisions. For example, a military unit is advancing across open territory. A decision to advance rapidly has been made. Suddenly an enemy supply depot is found. A new set of potentialities has been introduced and the former decision is questioned. Should the unit attack or circumvent the depot? The unit is spotted by the enemy and the unit attacks. The enemy introduces tanks. The attack is halted. An air strike is called in. A series of potentialities has been introduced which were not considered in the
initial decision to advance rapidly. Potential always emerges as the actions emerge in time. Thus, the choice is a process which emerges within open potentiality. Choice is not defined by the military planners who decide on advancing or not advancing. Choice emerges from the actions of the military system and the open possibilities that action brings.

Open Possibilities. Schutz indicates the importance of Bergson's analysis by distinguishing open possibilities from problematic alternatives. Bergson has shown that choice occurs during the stream of experience which takes place within open possibilities or potentialities, not within the closed possibilities of the past. The military planners had made the battle decision problematic. The choice was defined in terms of the two choices available in the past, advance or don't advance. But, the open possibilities of the present and future meant an enemy supply depot had to be considered and then enemy tanks. The planners used hindsight to make their decision. No depot had ever been in the way in the past and none ever would be there in the past. Projecting hindsight into the future creates foresight and foresight carries with it open possibilities. The future can change, a depot can be in the way. Foresight contains open possibilities, hindsight deals only with the closed possibilities of the past.
The Reflective Glance. Schutz agrees with Bergson's analysis of duree or inner time but Schutz extends the concept by adding a second concept of time which explains spatio-temporal time and its relation to duree. Past time, i.e., spatio-temporal time, can only exist when the "ego" removes its consciousness or attention from the duree and attends to past experience in what Schutz calls the reflective glance.

Schutz indicates that there are several levels of awareness or consciousness. This analysis has concentrated on the two levels of consciousness related to duree or inner time and spatio-temporal or past time. Organizations can be viewed as frozen, spatialized, already completed acts or as ongoing, emerging process which are constantly in the flux of becoming. The U.S. Air Force can be seen as an organization that has fought bravely in WW II, Korea and Vietnam or it can be viewed as a constant defender of freedom which is ready for all challenges to our nation's security. But, if we or the organization attempt to analyze the process of defense, the organization is framed in terms of the reflective glance. At one level of consciousness the Air Force constantly conducts the active process of defense. On a second level, the Air Force reflectively analyzes what it does. The second level introduces the reflective glance. The reflective level of the organization
introduces attention and self causation.

Levels of Consciousness as Attention. Time and consciousness or directed attention takes place at two levels. The process level of the duree is the pre-phenomenal level. The reflective level is the phenomenal consciousness.

We must, therefore, distinguish between the pre-empirical being of the lived experiences, their being prior to the reflective glance of attention directed toward them, and their being as phenomena. Through the attending directed glance of attention and comprehension, the lived experience acquires a new mode of being. It comes to be 'differentiated,' 'thrown into relief,' and this act of differentiation is nothing other than being comprehended, being the object of the directed glance of attention....For the Act of attention—and this is of major importance for the study of meaning—presupposes an elapsed, passed-away experience—in short, one that is already in the past, regardless of whether the attention in question is reflective or reproductive.24

Reflective Meaning. Meaning and attention are one and the same thing. Attention is constituted by the choices or selections that the organization makes. The organization is constituted by the process of selection. The organization is constituted by the selective process of attention. The organization interprets its environment, itself and its subsystems in terms of the selective attention which it directs towards each of these systemic levels. Meaning is enacted through the reflective selective process of attention. Selection orders the uncertainties of the world by enacting a pattern upon unpatterned events. Those selected patterns represent information. Information contains
reflective meaning for the organization.

Meaning and interpretation are reflective. The past is meaningful because attention has been directed towards a selected portion of past experience.

The meaning, in other words, is the kind of attention directed to the past. The kind of attention and the meaning of that which is attended to are one and the same thing. Since a backward act of attention emanates from a here and now, the attitude that exists in that here and now will determine the kind of attention, which in turn determines what is singled out and given definition....Meaning is not something apart from attention, something that exists alongside or above the act of attention for eventual attachment. Instead, the meaning of anything is the way it is attended to and nothing else.25

Reflective Time; Past, Present and Future. Reflective time allows the organization to create reflective meaning. The organization enacts or interprets its world reflectively. But, Schutz's concept of reflection is not defined by the Newtonian concepts of past and determinism. Reflective time is a more complex concept involving emergence of entities from prehensions or relations of past, present and future.

Therefore, says Husserl, each actual experienced present carries along its horizon of the experienced past, which is necessarily always filled with content, and its horizon of the future, which is empty or filled merely with the content of the anticipated future present. This means that every present moment has about it a 'fringe' of experiences which constitute the one primordial fringe of the pure ego, its total primordial now-consciousness. What student of James would not recognize the latter's famous theory of the "specious present' in this basic concept of Husserl's?26
There are several concepts developed by Schutz which will help define his concept of reflective time including; projection, in-order-to motives, because motives and relevance. The reflective glance is not defined by the past alone—it also includes potential future relations and present relations.

I have spoken, very loosely, of the particular moment of time, the Now, at which the stock of knowledge is at hand. But in truth this Now is not an instant. It is what William James and George H. Mead have called a specious present, containing elements of the past and the future. Projecting unifies this specious present and delimits its borderline. As far as the past is concerned, the limits of the specious present are determined by the remotest past experience, sedimented and preserved in that section of knowledge at hand that is still relevant to the present projecting. As far as the future is concerned, the limits of the specious present are determined by the span of the projects presently conceived, that is, by the temporally remotest acts still anticipated modo futuri exacti.27

The Project. Schutz's notion of the project is important to how meaning is enacted. Action is determined by past acts, interests of the present and potentialities of the future. As Schutz has indicated, it is the project which unifies these elements into action. Action emerges from the system's past, present and future. If meaning is reflective how can future relations enter into interpretive action? Weick explains how projected future acts contain the temporal characteristics of pastness.

I think of the future action as if it had already been completed. My statement contains both future and past time. Even though a plan appears to be
something oriented solely to the future, in fact it also has about it the quality of an act that has already been accomplished. The meaning of the actions that are instrumental to the completion of the act can be discovered because they are viewed as if they had already occurred. We have said that meaning is established retrospectively. Thinking in the future perfect tense retains this requirement. The actions gain meaning because attention is directed to them as if they had already occurred.28

Choice which constitutes the way in which action emerges from potentiality is constituted by reflective interpretation. Choice is based upon the projection process (cf. p. 244). The project unifies the past, present, and future. In the dimension of time; foresight and hindsight are equal except for one crucial distinction; the past is irrevocable and irretrievable but the project is characterized by open potentiality.

For example, military planners are often accused of fighting the last war. Planners who fought in Vietnam often plan for a similar war. But the next war will introduce new potentialities which cannot be accounted for by the closed possibilities of what happened in the past. The open potentiality of the projected act is what leads to novel, creative decisions; what Schutz calls spontaneous action.

**Definition of the Situation**

According to Schutz man lives in a world which is defined by reflective meaning. He exists in space, time and a society. The reflective world includes elements which
can be controlled and elements which are not controllable. Man is affected by both the controllable and the non-controllable elements. Man comes to terms with these elements through interpreting or defining his situation.

Choice. Limits are imposed upon action (Whitehead's physical pole) but action is open to creative response (Whitehead's mental pole; Schutz's spontaneous activity). It is the elements which are controlled which are of primary interest.

Organizations are social entities. They can control the world but they are also controlled by the world. The military has many potential actions open to it but it is not totally free to act. The physical universe is imposed upon the military and it limits possible actions. An army can not exist in climatic extremes without proper equipment. Armies cannot be moved without logistics. Physical limits do limit the actions of organizations but not completely. Armies have many potential activities within the physical limits.

Any situation consists of pregiven limits. These can be given by nature or by society. Social systems and individuals are free to "act" within these limits. The freedom to "act" is characterized by the ability to choose to make selections. Spontaneous choice leads to the creative "subjective" interpretation of the situation. This
is comparable to Whitehead's notion of *causa sui* or creative process. This leads to two questions: what actions will emerge and why?

**The Pregiven World.** The world is always given as a preorganized world. The world is preorganized and pre-given by both nature and society. The pregiven world, the interests that arise from the past, the present and the system of projects constitute the emergence of action. It is the project which unifies action.

All systems and organizations emerge in a pregiven world. Schutz indicates two transcendences, Nature and Society. They are transcendent because consciousness of them is not total, a part of them transcends immediate consciousness. A part of them also transcends potential consciousness. Thus, Schutz distinguishes between the potentially knowable transcendences and the unknowable transcendences.

The pregiven world of the organization includes a natural world, a social world, a spatial world and a temporal world. All of these worlds are simply various aspects of the organization's world. But it is a world in process; one which has changing limits and changing potentialities. A military unit fights a battle in a specific physical setting, within a specific social-cultural environment, in a specific area and at a specific time. The
military action occurs in a pregiven world but a world with changing potentialities. A fog can come, the temperature can change, moral support can determine the outcome of a battle on the basis of changing social-cultural factors; each of these potentials are pregiven but subject to change.

...each world within potential reach, once transformed into actual reach, will again be surrounded by new horizons, and so on....But in the common-sense thinking of everyday life we simply know that Nature and Society represent some kind of order; yet the essence of this order as such is unknowable to us. It reveals itself merely in images by analogical apprehending. But the images, once constituted, are taken for granted, and so are the transcendences to which they refer.

The Organization Defines Its Situation. An organization must deal with the elements of the world by interpreting the meaning of the world for its own purposes. A social organization "defines its situation" through actions which enact a reality or interpretation of the world.

Rather than treating such definition as a 'response' or 'reaction' to certain objectives states of affairs, the social scientist, Dr. Schutz suggests, has to understand that definition means action and that interpreting the world is a prime mode of acting in it.

The action which constitutes the organization also constitutes the organization's interpretation of the world, its interpretation of reality and the meaning of the action.

The actions of the organization are the organization. The organization's actions interpret the world for the organization. A military unit defines itself in terms of
the actions it takes. For example, a military unit approaches a village that might be a friendly or an enemy village. The status of the village is uncertain. The actions which the unit takes in the village will define its status as friend or foe.

The Unquestionable. The pregiven world constitutes a pregiven way of interpreting the world. The pregiven world is experienced by man as an intersubjective world which leads to the "natural attitude" of the "every-day," "common-sense world." Husserl calls it the "life-world" (Lebenswelt) characterized by the natural attitude. The natural attitude represents the unquestioned assumptions about the world. These assumptions carry with them a set of expectancies which are experienced as typical.

The pregiven world provides a pregiven interpretation or "definition of the situation." The assumption is what has proved valid thus far in experience will remain valid in the future. A "natural attitude" develops in which the natural world and social world are accepted without question. The situation is taken for granted. What has happened in the past can be accomplished in the present and the future. The organization expects the world to function as it has in the past. A military unit which has suffered casualties upon entering a village in the past will initially interpret the village in terms of
the unit's past experience. At the outset the village will be interpreted as an enemy village, until further notice. The village is viewed in terms of an unquestioned, typical interpretation. The set of previous experiences is accepted as given without question. Similar losses are anticipated and expected.

Events are related to previous experience. Consciousness typifies events according to previous acquaintanceship. That which is typified by past experience. The typification can be individual or socially derived but social typification represents the bulk of these typifications. Typification arises out of the "problem at hand" for which the type was formed.

...which traits or qualities of a given object or event I consider as individually unique and which as typical, depends upon my actual interest and the system of relevances involved--briefly, upon my practical or theoretical 'problem at hand.' ...Thus, typification depends upon my problem at hand for the definition and solution of which the type has been formed. 31

The Questionable. It is the experience of doubt which leads to choice and selection. The military unit may face experiences which violate its expectations. The unit has lost members in the village in the past. It expects a hostile village. What happens if a villager approaches with information about hidden enemy troops and supplies? This behavior is not expected in an enemy village. The interpretation of the village as an enemy village
has been given as unquestioned but the villager's help has introduced a new uncertainty. What has been unquestioned now becomes questionable. Doubt enters the situation. A new definition of the situation must be formed so that the doubt might be resolved. The problematical situation leads to a definition of the situation which solves the problem of doubt. The military unit reevaluates its interpretation of the village as foe. The unit modifies its expectancies.

What is relevant for the solution of a problem? When does it appear to us as 'sufficiently solved' as far as our purposes are concerned so that we discontinue further investigations?

All these questions point to different meanings of the concept of relevancy, some of which will be analyzed in the following.33

What is known or unknown is determined by the organization's historical situation.

The content of what is known, familiar, believed and unknown, is therefore relative: for the individual relative to his biographical situation, for the group to its historical situation.33

The way the organization defines its situation is determined by what it "takes for granted" and what is open to "doubt." The organization attempts to resolve doubt through the action (or process) of interpretation. How the organization selects what is problematical leads to the notion of relevance.

When the world can no longer be taken for granted. When expectancies founded upon past experience and typification prove to be inadequate to define the situation,
then doubt has created a problematic situation.

How are Actions Selected?

Schutz defines action in terms of projected acts or projects.

The term 'action' as used in this paper shall designate human conduct devised by the actor in advance, that is, conduct based upon a preconceived project. The term 'act' shall designate the outcome of this ongoing process, that is, the accomplished action.... His starting point was a distinction between action and behavior. The distinguishing characteristic of action is precisely that it is determined by a project which precedes it in time. Action then is behavior in accordance with a plan of projected behavior; and the project is neither more nor less than the action itself conceived and decided upon in the future perfect tense. Thus the project is the primary and fundamental meaning of the action.34

A project anticipates future acts by visualizing a completed act. But is the future act which is visualized not future action?

Motives. The future perfect tense of the project is important in explaining motives. Schutz gives two distinct notions of motive. The motive which deals with "the end which is to be brought about" is called the "in-order-to" motive. From the point of view of the actor this class of motives refers to the future. Past experiences which determined the act are the second class of motives. These are called because motives and they can only be interpreted retrospectively with a reflective glance. It is the in-order-to motive which characterizes projecting.
The project always occurs in the "here and now" of the present but it unifies the preacquaintance of the past (hindsight) with the open potentialities of the future (foresight). It is the project which bestows meaning upon action. Action is never isolated, it always has horizons of relatedness (i.e., Whitehead's prehensions). Relationships are a combination of potential (open) relations and past (typical) relations.

The previous example about the villager providing information about the location of enemy troops illustrates this point. Should the unit believe or not believe the villager? There is a projection of possible actions and possible consequences. The enemy might be caught off guard or the unit might be ambushed. Past experience would indicate a possible ambush. But a military advisor indicates the villager has given reliable information in the past. The potentialities have changed, the projects are modified. Other potentialities emerge. An enemy flag is found. The villager's story is checked and weapons are found. Each experience modifies the possibilities of the situation. Actions emerge; projects are modified; the situation is defined by the military organization.

The situation is typified in terms of past experience and the problematic experiences of the present. The past
interacts with the present and future so that a new definition of the situation emerges.

We may say that the world within my actual reach belongs essentially to the present tense. The world within my potential reach, however, shows a more complicated time structure. At least two zones of potentiality have to be distinguished. To the first, which refers to the past, belongs what was formerly within my actual reach and what, so I assume, can be brought back into my actual reach again (world within restorable reach)....

As this first zone of potentiality is related with the past, so is the second one based upon anticipations of the future. Within my potential reach is also the world which neither is nor ever has been within my actual reach but which is nevertheless attainable under the idealization of "and so on" (world within attainable reach). 5

Choosing Among Objects Within Reach. Choice is founded on a choice between alternatives. An entity is faced with an infinite number of potential paths which must be transformed into a finite number of alternatives. This transformation takes place when the entity defines its situation in terms of projects.

According to modern sociology, the actor has 'to define the situation.' By doing so he transforms his social environment of 'open possibilities' into a unified field of 'problematic possibilities' within which choice and decision—especially so-called 'rational' choice and decision—becomes possible. 36

But projecting is under the entities' self control although it is limited by natural and social horizons.

The organization has open possibilities for its actions. It is equifinal because it can choose among all possibilities open to it. The organization is
self-controlled because it determines which possibilities will be transformed into action. A military unit approaching a village has many potential choices. The unit can enter or not enter; call an air strike or not call an air strike; send in a spy or not send in a spy, etc. The possibilities remain open until action leads to an act. If the unit decides to enter the village and acts to enter the village, it can never decide not to enter. The past is irrevocable. But once the unit has entered the village new possible actions are presented to the unit.

The organization uses projecting to unify open possibilities into completed acts. The organization oscillates between projects until a decision leads to a selected act. Projecting leads to emerging possible alternatives anticipated in fantasy. The oscillating continues until the situation is sufficiently defined. There is a free act emerging from spontaneous action.

Tendency is, thus, succeeded by countertendency until the 'in-order-to motive' of the prevailing project leads to the 'volonte consequence, decretoire et definitive,' to the voluntative fiat: 'Let us start!' ....a dynamic process in which the ego, its sentiments, its motives and goals are in a state of continuous becoming until this development leads to the free act. 37

How does the Entity Decide upon a Particular Project?

I decide upon a course of action in one direction rather than another in the light of what I deem to be relevant.... 38

Entities do not operate on a single level of relevance. There are multiple levels of relevance. All systems of
relevance are founded upon past experience; the historical situation. But the project introduces spontaneous activity.

**Which Actions are Possible? Relevance.** Any entity must define the situation as it has been pregiven. There is the pregiven world of nature, cf society and the subjective entity. The pregiven world is typified in terms of past problems and past experience. But the entity combines pregiven typifications with spontaneity. The entity must define the situation through projected acts. Three elements determine which alternatives will be selected; the ontological pregiven world and the historical situation are two elements. The third element is spontaneous apperception.

Closer analysis shows that the concept of a situation to be defined contains two principal components: The one originates from the ontological structure of the pregiven world. To make a glass of sugared water, Bergson says, I must wait until the sugar has dissolved. The other component which makes it possible to define certain elements by singling them out of the ontologically pre-given structure of the world originates from the actual biographical state of the individual.39

Projects and plans unify the objective causal world and subjective experience. (This is similar to Whitehead's notions of physical and mental poles.)

The organization experiences an objective world which can help or hinder the organization's actions. There is a system of complex interests, problems, projects which form plans for action. These plans emerge from the process of being. "Plan" is used in an enlarged sense which
does not require deliberateness. The military unit emerges both out of the given social and natural situation and from the choices the unit makes about which possible actions to take or not to take. The unit uses plans, projects, interests, motives and relevancies to determine which actions will emerge.

**Motivational Relevancy.** Plans determine the current interests which select from the objective world and the pregiven stock of knowledge those elements which are required to define the situation.

The life-plan thus determines the particular plans which, in turn, determine the current interests... In other words, the interest determines which elements of both the ontological structure of the pregiven world and the actual stock of knowledge are relevant for the individual to define his situation thinkingly, actingly, emotionally, to find his way in it, and to come to terms with it. This form of relevancy will be called 'motivational relevancy' because it is subjectively experienced as a motive for the definition of the situation.\(^{40}\)

If the situation is defined in terms of past typifications there is no questioning of the world as given.

The actual stock of knowledge is nothing but the sedimentation of all our experiences of former definitions of previous situations, experiences which might refer to our own world in previously actual, restorable, or obtainable reach....If the elements of our stock of knowledge, which are at our disposal in the mentioned gradations, suffice for the definition of the situation, as far as motivational relevancy is concerned, then the definition takes place as a matter of course in the form of the unquestionably given. Such will be the case in all affairs of routine.\(^{41}\)
Thematic Relevancy. If, however, the situation cannot be defined solely in terms of the stock of knowledge, then the situation becomes questionable.

...the relevant element is no longer given as unquestionable and has to be taken for granted: on the contrary, it is questionable but also worth questioning, and for that very reason it has acquired relevancy. That relevancy will be called 'thematic relevancy' because the relevant element now becomes a theme for our knowing consciousness, a process which in traditional psychology has usually been treated under the heading of 'attention'... 42

It is this theory of relevancies which underlies the selections of the project.

An organization or social system will act in terms of past experience and routine if the situation is not perceived as uncertain or questionable. But if a situation leads to doubt and uncertainty then the doubt presents a thematically relevant problem. A society can use patriotism to justify the draft because in the past it has proven successful. If, however, draftees begin to reject the patriotic justification, then the society faces a problematic situation. The theme of justification of the draft is relevant to the society's choice of actions.

An Enacted Past

How is organizational memory constituted? An organization is the process of interpreting itself. The organizational memory process is constituted by the way in which the organization attends to its past. Three crucial
subprocesses constitute organizational memory; acquisition, retention and retrieval. Information is encoded in the acquisition process. Information is ordered over time in the retention process. Information is decoded in the retrieval process. Decoding involves interpretation. The decoding process determines what past information is attended to. The retrieval process interprets past experiences for the organization.

This means that the retention process and the persons who mediate between it and the selection and enactment processes are the most crucial points in terms of organizing. The person who makes decisions about what the goal of the company should be next year is less important to continued functioning than is the person who decides what is known by the company. The company historian in a very real sense is also the company prophet.43

The memory process, consisting of interlocked behavioral patterns governed by the laws and rules of relationship, interpret past experience. The information selected for attention by the memory processes constitutes memory for the organization.

The selection or attention process interprets the past for an organization. The time dimension adds to the complexity of the organization since the selection process and projections unify the past, present, and future in spontaneous, creative action. The selection process is a super-individual information processing activity. The past is represented as information which
is interpreted by super-individual activity. Three component processes have been designated: acquisition, retention, and retrieval. All three processes are accomplished by super-individual actions, and all three process information. The super-individual interpretation is meaningful on an organizational level. It is not necessarily meaningful to the individual. The interpretation of the organization is not equal to the sum of the individual interpretations. There is a meaning for the organization which transcends individual meaning.

The organization selects information from the past on the basis of relevancy. That which is relevant to the organization constitutes the past for the organization. But, the relevance of the past is related to the relevances of past, present, and future. The past is continuously enacted and thus, the interpretation is constantly changing. It is constantly in the process of becoming. Habitual organizational actions are constituted by motivational relevancy. Past typifications go unquestioned. Action is defined by past experience. When the organization is unable to "define the situation" solely in terms of what is "taken for granted" then the interpretation is open to doubt. Actions are questionable. The thematically relevant problem opens action to alternative and potential actions. The organization interprets the problem in terms
of relevancy.

The attention/selection process is operative in all three memory subprocesses: acquisition, retention, and retrieval. Each of the three subprocesses involves information selection.

**Acquisition, Retention, Retrieval**

Acquisition, retention, and retrieval form the processes of organizational memory. The organization interprets the world in terms of information; therefore, all three subprocesses are information processes. Matter-energy processes are beyond the scope of this analysis. When we represent the environment in terms of information, we can state that systems deal with this information selectively.

**Acquisition**

The organization deals with an environment composed of information. But the organization must deal with the information of the transcendent environment interpretively. The organization or system selectively deals with information from its environment. This can be termed "organizational attention" since the organization attends to only selected portions of its environment. The organization has a limited number of mechanisms for selecting information. Mechanisms which input information from the environment into the system are analogous to the senses of human
systems. The super-individual mechanisms are especially important from a process perspective. The behavioral interaction patterns of organizational communication represent an important part of the organization's "perceptual mechanisms." The dynamic activity of collective actions is what creates the ordered external environment for the organization. The physical structure or "markers" have little meaning outside the dynamic pattern of activity or process which they represent. The environment becomes what the organization's selection process "attends to." The selection process is an "enactment" process.

The infinite environment is inherently entropic and uncertain. The organization is teleologically defined by its need to interpret the environment. The acquisition process is directed at the removal of equivocality. Information results when uncertainty is removed. The environment is ambiguous and subject to a variety of interpretations. The acquisition process makes "sense" of the environment by interpreting it in a specific manner. The interpretation of the acquisition process constitutes the "enacted" environment of the organization. The enacted environment represents information about the environment. The organization processes information from the acquisition process. The environment is interpreted in terms of an orderly pattern of information.
The acquisition process creates a specific interpretation of the environment, i.e., the organization's information about the environment, from an infinite number of potential informational interpretations. The potential interpretations are represented by the construct of transcendent environment. The specific informational interpretation is represented by the construct enacted environment. The acquisition process is continuous, ever becoming.

**Coding.** The enactment process is an encoding process. The organization codes the information which defines its environment. The acquisition process' coding of information is crucial to the subsequent processes. Unless something is attended to and coded, it does not exist for the organization. The coding at acquisition is also critical in the later stages of processing. In order to use coded information the user must be able to decode the information. The acquisition process and subsequent processes must agree upon the code. Processes must share a common set of rules and procedures for using the coded information. Interpretation is dependent upon a common code. If the agreed upon rules for coding are absent, encoded information can represent uncertainty to the decoder.

The coding process is a multilevel phenomenon. Coding occurs at many levels often simultaneously.
organization "orders" the information through several techniques. Categories can be used to classify information. Pieces of data are organized by linking them to categories. Associations are formed linking information to the system's perspective of an ordered environment. Entropy is removed by transforming incoming information into the organized patterns of the system.

Once the system has encoded, recoded, and "chunked" the information, it can select information for retention. Retention mechanisms can be intentional or non-intentional. But, retention, discussed later in this chapter, is selective; thus, it is another form of the enactment process. If information is to be retained for future use, it must be organized into a pattern which is retrievable. Retrieval, the third subprocess to be analyzed in this chapter, is possible if the correct associative links are established.

**Indexing.** Indexing involves ordering information into a hierarchical classification scheme. The classification stores the location or "address" of the information. The index is meta-information about the location of the coded information. The index locates the information in time and space; it allows the system future access to the information. Association locates information by using a sequence of links. There is an organized "field" of links between patterns of information. An association rule
establishes a method of locating information by following a chain of associations. Retrieval is dependent upon a correct interpretation of the direction to search, as indicated by the rule. Selection assumes choice. Choice assumes a control or decision making mechanism or process. Decisions are not explained deterministically by negative feedback loops, but by the emergent properties that are determined by complexity, potentiality, equifinality, and relevance.

Weick points to the fundamental problem presented by these two alternatives. He writes:

Perhaps the most stubborn problem with selection criteria is that social systems use two types of criteria: criteria relevant to the internal functioning of the system, and criteria relevant to the external functioning of the system with its environment. And it is entirely possible that internal criteria are applied more frequently than are external criteria.  

S-R psychology and cybernetic theory explain choice in terms of the external environment, which programs decisions through past conditioning. G.S.T. emphasizes the role of internal choice.

Retention

Retention is the second memory subprocess. It is closely related to the acquisition process, especially in time. If an item of information is not acquired by the system, it cannot be selected for retention. Not all information which is acquired is retained. Retention is
also selective. Information which is to be retained must be coded into a medium which will endure over time. The retaining medium must maintain the pattern and order of information over time. If the pattern of information is changed, a transformation has taken place. The medium can decay in time or be interfered with by subsequent inputs. If this results in an alteration of the stored pattern, a transformation has occurred. Decay and interference usually result in a loss or deletion of information. If the code is changed, there is a recoding transformation.

Information which is to be retained must be organized or recoded for retention. There are at least three forms of retention; namely, retention in space (or records), structural-functional retention, and retention in process (over time).

Retention in Space. This is the most widely accepted concept of memory. Spatial retention involves storing information in a spatial medium which persists over time. Information is stored as a physical record. The information is represented by a physical marker. The marker can be represented as a structural modification within the system. Thus, there is a physical representation of memory. Memory becomes objective. However, this concept is not consistent with a definition of memory as a process.

What is important is the process by which the information is used by the system. This process is social and
involves organizational communication. The information must be encoded and decoded by communication processes. Both the encoding and decoding processes are crucial; the storage is secondary.

Organizations have several mediums for storing information. Many of the processes include designing and using symbols for the organization of information. Symbols can be recorded orally or in written forms. Oral records include phonographs, records, speeches, conversations, etc. Books, files, policies, correspondence, printouts, etc. are examples of written records. A common example of a written record is an organization's library. Libraries store books, documents, films, tapes, maps, publications, policy statements, etc. The information is stored in a medium which can be stored by the library. The library in turn organizes the information so that it may be located for future use. The library creates a classification and indexing system which represents the information as meta-information. The meta-information of the indexing system is used in the search procedure which precedes retrieval for use.

Organizations also store written information in computers. The storage medium might be a punchcard, magnetic tape, or some other form of computer memory. The information is encoded onto a physical medium, but it is also transformed or reorganized. Information is organized and
indexed so that it can be located through an efficient search procedure.

There are several less obvious ways in which information can be spatially recorded. Military uniforms and medals contain a great deal of information. They indicate rank, training, years of service, authority, past experience, etc. Labels such as job titles also indicate information about authority, training, job duties, etc. The recorded information might be intentionally or unintentionally available. If a user is able to decode the information, it becomes available to him. The size of an office, the physical arrangement of items in the office, or location of a parking space—all are forms of structurally recorded information.

**Structural-Functional Retention.** A second form of retention is structural-functional retention. The retained information is a program laid down in the structural construction of the system by a "designer." Information is generated, but the data or information is not directly stored. A **procedure** for generating information is stored. A function for generating information is called a generating function and is equivalent to the concept of a stored program. Heinz von Forerster (1965) illustrates a structural-functional retention system:

The answer to the question of whether I should 'store' the information of a $10^{10} \times 10^{10}$ multiplication table
in the form of an 8½ x 11 in book 6 billion miles thick, or in the form of a small manual desk computer, is quite obvious, I think. However, it may be argued that the computer does not 'store' this information but calculates each problem in a separate set of operations....If I can retrieve this information, it must have been put into the system before....the information is stored in the computer in a structural fashion. In the way in which the wheels interact in cutting notches and attaching pegs, all the information for reaching the right number has been laid down in its construction code, or, to put it biologically, in its genetic code. 45

A machine is programmed to function by its designer. Living systems can be said to be programmed by their external environment in the form of evolution or learning. Biological organisms are programmed by their genetic information. The genetic code determines the structure of the system. The genetic program is altered by a process of "random selection." But, certain organisms also have a second form of programming represented by an ability to adapt to the external environment through the process of learning. Again, it is the external environment which programs or determines the actions of the system. Past information about the environment is retained in the form of a generative program. Krippendorff states:

What is being acquired are effective procedures for coping with an environment—not with any environment but rather with the one that the organization had to face in the past and, by induction, may have to face in the future. Structures that allow an organization to take full advantage of given opportunities and to counter recurrent threats clearly constitute a kind of organizational experience. And when such structures guide, constrain, or in any way affect future
organizational behavior, they, in the technical sense, memorize the past properties of an environment structurally.\textsuperscript{46}

Language acquisition and language use can be explained in terms of a structural-functional memory. Many linguists argue that language is a generative process with a generative grammar.

A strictly structural-functional explanation of memory suggests some problems. A system which strictly follows a program is incapable of survival in a changing environment. The system must adapt to the changes in order to survive. There is an inherent conflict between the program which represents the past and the need to behave creatively in order to adapt. As Weick states, "An organization will continue only to the degree that there is both 'conformity and non-conformity'..."\textsuperscript{47}

\textbf{Retention in Process.} The third form of retention is retention in process. Information is retained over time through active processes within the system. Some social processes which maintain information do not include records or programs. Information can also be retained as a process. The process contains and retains information. The information is coded into an interlocked behavioral pattern over time.

The combination of roles in interaction memorizes an interaction sequence and thus constitutes a social memory of super-individual information.\textsuperscript{48}
The interlocked behavioral processes which are the organization also retain information about the organization. An observer who knows how a system behaves over time knows something about how that system behaved in the past. The system's pattern of activity retains information about the system's past. Information is retained by continuous activity, which constitutes the system. The way in which small group members interact contains information about how those behavioral patterns were formed. Likewise, the way in which an organization's members interact contains information about which behavioral patterns formed these behavioral cycles.

The social history of an organization is contained in its behavioral patterns of the present. The acculturation of an individual into a social role might be reconstructed on the basis of his present social behavior. For example, the way a community reacts to a mentally retarded child contains information about that culture's instruction of individuals. The use of identifying labels by group members contains information about the group's development over time. The small group researcher might develop an efficient retrieval and search procedure for decoding the historical information retained in the present group behavioral patterns.

If the memory process is completely stopped or interrupted, the retained information can be lost or
distorted. If a society can no longer conduct the process of acculturation, it can lose its ability to perpetuate itself. The social memory, which is society's own unique cultural heritage, is lost unless it is continuously maintained in an active process of transmission.

**Retrieval**

The final subprocess of organizational memory is the retrieval process. Retrieval is an enactment process. Retrieval interprets the past for the organization. The past exists as information. The organization selectively attends to information about its past. The interlocked behaviors of the retrieval process select and interpret information about the past. The interpretation of the retrieval process constitutes the past for the organization. The communication processes of retrieval "enact" a past reflectively from the actual transcendent past. Doubt is resolved by the interpretive process of retrieval. The past is ambiguous and subject to a variety of interpretations. The interpretation of the retrieval process is the organization's information about its past. The past is evoked when processes face doubt or uncertainty. Processes can use information about the past only if they share a common code. Information from the retrieval process is the final outcome of the memory process; thus it could be equated with the construct organizational memory. But,
all organizational processes are multiple, continuous, ever
becoming. There are many potential pasts for an organiza-
tion. The retrieval process constitutes which interpreta-
tion emerges.

Transformations. Past information which is maintained
in the memorizing process is subject to many transforma-
tions. Transformations occur in acquisition and retention,
but the greatest transformation occurs during retrieval.
Bartlett has suggested that retrieval is a reconstruction
process, not simply a matter of removing data from storage.
Retrieval is a process of interacting with data. Informa-
tion is transformed as it is retrieved and decoded; encod-
ing and decoding are active processes.

The organization enacts its past by reconstructing
that past during the retrieval process. Thus, retrieval
is an integration process combining present, future and
past experiences. Retrieval is an active process deter-
mined by the system's equipotentiality as much or more than
by the system's past experiences. This is how systems are
able to exhibit new and creative behavioral choices. Sys-
tems must be able to balance creativity with past informa-
tion if they are to adapt to changing external environ-
mental conditions.

Search. The relationship between an observer and the
process of retrieving is interpretation. For example, a
library is simply a stack of written information unless someone interprets it. The library user must be able to locate the information within the library's retention process. Location involves a search for the information in space, time, or process. Both search and location aid the decoding process.

Search selects specific information by locating it in the vast amount of retained information. Effective search procedures are based upon prior organization. Prior organization involves classification and indexing at the acquisition and retention phases. Indexing creates meta-information about the location of retained information. The meta-information provides a hierarchical classification that dictates the search procedure, ideally in the form of a decision tree proceeding from general to specific classifications.

**Conclusions and Implications**

It would be presumptuous to suggest that these conclusions constitute a complete theory of memory in organizational communication process. Rather, a tentative theory of organizational memory has been developed. Significant implications of this work are: the notion of memory has potential impact for the field of organizational communication, and additional study of organizational memory is required to formulate a more comprehensive theory.
The concept of memory is not only useful, but it is essential to the study of complex organizational communication systems. March, Simmon, J. Miller, A. Fisher and others have indicated the role of memory and the past in the study of organizations. The Whiteheadian notion of process has been used to develop a theoretical formulation based upon the process perspective. Whitehead, Bertalanffy, and Schutz have been discussed to provide a unique theory of memory in organizational communication that is clearly founded upon a process orientation.

The analysis of the literature has led to a reformulation of the theory of the memorizing process in organizational communication. The analysis of Whitehead's notion of process has served as the basis for the development of a tentative theory of constitutive memory processes in organizational communication. Memory is conceived of as a process not as a function of individual psychology or individual neural activity. The psychological model has had a great deal of impact but it was found to be an inappropriate explanation of organizations' super-individual, i.e., social, memory processes.

General system theory provides a process perspective for the analysis of organizational communication. Yet, general system theory has not provided a theory of the memorizing process. The literature on Skinnerian
behaviorism, cybernetics and general system theory have all treated memory as a thematic concern. The role of memory has been recognized by researchers like March, Simon, Weiner, J. Miller, G. Miller, Bertalanffy, Weick, Bantz, and others. This analysis has transformed the thematic concern into the problematic question of how memorizing processes are constituted in organizational communication.

Chapter V has formulated a tentative answer to this central question. Organizations are constituted by the super-individual processes which create and maintain social collectives. Organizations are defined by the continuously executed processes which constitute the organization. If process is halted the organization no longer exists. Organizational processes are accomplished by super-individual action, not individual action. The super-individual processes of the organization are emergent not summative. The super-individual actions are more than the sum of individual actions.

Super-individual processes are accomplished through patterns of interlocked communication behaviors. Communication patterns are the basis of super-individual processes. Organizations are information processors. The information processing analogy provides a perspective for analyzing organizational communication processes.
Organizations define or interpret their situations in terms of information patterns. The organization's internal and external environments are represented as information. The organization interprets or enacts its environment. The environment is chaotic and uncertain. The organization must define its actions within that uncertainty. The organization creates order and patterns, i.e., information, for dealing with the uncertainty of its every-day existence.

The explanation of the memorizing processes is an explanation of how organizations deal with the uncertainties which arise from past experience and its relation to present and future experience. This analysis has emphasized the temporal orientation in order to better explain the relation of past, present and future. That analysis extends the understanding of memory processes beyond spatially oriented explanations. A second temporal concept was developed: the concept of complexity.

Complex organizations are characterized in this analysis by their ability to perceive many potential alternatives and by their ability to make selections among those alternatives. The selections transform uncertain potentials into ordered patterns, i.e., the uncertain environment is coded into information. The information enables the organization to define its situation in order that it might act. Action emerges from all three temporal dimensions
of past, present and future.

An organization enacts its environment. Part of the environment is constituted by past experience. Thus, the characterization of memory as an enactment process, i.e., the enacted past. The past is constituted by an interpretive organizational process. The past for the organization is constituted by the organization's attention to the past. The organization's interpretation is spontaneous and creative. The organization chooses what its past will be in accordance with its set of interests and relevancies. Choice is based primarily on internal factors not external factors. The processes of the organization determine how the organization will interpret or attend to its past. Three subprocesses were designated: acquisition, retention, and retrieval.

How does the organization enact its past? The temporal orientation advanced in this analysis is the basis of the theory of memorizing processes. Action emerges from the duree of process time. But the reflective glance introduces creative spontaneous action. Process time is constituted by open possibilities which are made problematically by the reflective glance. The past becomes meaningful because of the organization's reflective interpretation of the past. The organization directs its attention to a selected portion of its past. "The meaning of anything
action. If the situation creates doubt, then the situation becomes problematic or questionable. The problem results in a review of potential courses of action. A definition of the situation, i.e., action, solves the problem. Uncertainty is reduced through an interpretation or definition of the situation. Organizations use super-individual communication processes to define their situations.

The preceding theoretical analysis answers the question of how the memorizing processes are constituted in organizational communication. Thus, researchers are conscious of an aspect of organizations that would not previously be available for analysis. There is a new potential for questions and answers at a new level of complexity. Hopefully, there will be a greater potential for modifying the actions of organizations. A tentative theory of memorizing processes should create a consciousness of organizational processes which otherwise would not be available for reflection.

Some Limitations

Answers lead to new questions, especially when a theory of process is involved. In fact, any theory of process must be stated in terms of "reflective" formulations. Such reflective formulations must transform process into reflective consciousness.
is the way it is attended to."

How does the organization choose or select the past to which it will attend? The reflective consciousness of the organization interprets its past. Consciousness is broadly interpreted as attending to some relevant potentiality. Consciousness is not interpreted as psychological consciousness. Potentialities emerge from the past, present and future. The project unifies these potential choices into a definition of the situation which is constituted by action.

Action is behavior in accordance with a plan of projected behavior. The project determines what action emerges. The project occurs in the present but it unifies the because motives of the past with the in-order-to motives of the future. The project is an oscillation between potential courses of action until a spontaneous fiat results in a free act.

A course of action is chosen in terms of what is relevant to the situation. The project determines which potential course of action will emerge within the limits of the causal world. Projects select which elements of the stock of knowledge are relevant to a definition of the situation. If the situation is defined in terms of pregiven typifications, there is no questioning of the situation. Routine behavior characterizes unquestioning
action. If the situation creates doubt, then the situation becomes problematic or questionable. The problem results in a review of potential courses of action. A definition of the situation, i.e., action, solves the problem. Uncertainty is reduced through an interpretation or definition of the situation. Organizations use super-individual communication processes to define their situations.

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Some Limitations

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There are several characteristics of the process perspective that lead to theoretical difficulties. They are:

1. Processes are continuous in time, and change is continuous.
2. Science tends to attend to the "frozen instant" instead of the "continuous becoming."
3. Time is an important process variable.
4. Processes are characterized by multilateral mutual causal relations. These characteristics lead to a number of difficulties in describing processes. Schutz indicates the crucial difficulty as the need to use reflective formulations to describe process.

The transition from prereflective to reflective levels of consciousness is problematical. Super-individual reflection is a notion which should be distinguished from individual reflection. Likewise, super-individual relevancies can be distinguished from individual relevancies. The theory of organizational memory developed in Chapter V could benefit from extended studies of the prereflective, super-individual questions.

Successful application of the concepts developed by the final tentative theory of organizational memory rests with the development of more specific implications. Additional study is needed to delineate specific consequences of the basic concepts and assumptions. Hawes suggests that theories stated in the form of postulate and axiom statements can be reformulated by adding statements which are
empirically valid general statements. This involves the development of operational definitions for the theoretical statements. No attempt has been made in this analysis to operationalize concepts. Analysis has followed Fisher's suggestion that alternative formulations are heuristically valuable. But the statements might potentially be operationalized. Bantz's study of Weick's theory of organizations suggests possible methods. There are aspects of organizational memory that could be studied empirically, but research should not be done at the cost of the process perspective.

The relevance of the concepts of memory, process, and organizational communication are interrelated. Each concept adds to our ability to understand complex organizational communication processes.

The increasing recognition of the importance of organizations in our society highlights the need for effective organizational communication. The concept of organizational memory does extend our understanding of communication processes within organizations.
Chapter V
Footnotes

1 J.A. Miller, *op. cit.*, pp. 12, 42.


3 J.A. Miller, *op. cit.*, p. 70.

4 Ibid., p. 15.


6 Weick, *op. cit.*, p. 27.

7 Ibid., p. 46.

8 Krippendorff, *op. cit.*, p. 23.

9 Ibid., p. 24.

10 Ibid.

11 Ruben, *op. cit.*, pp. 198, 199, 200, 201.


14 Ibid., pp. 99, 100.


17 Shannon, *op. cit.*, p. 100.

18 Ibid., p. 106.

19 Ibid., pp. 106, 107.

21 Ibid., p. 104.


23 Schutz (1962), op. cit., pp. 85, 86.


25 Weick, op. cit., p. 67.


28 Weick, op. cit., pp. 65, 66.


30 Ibid., p. xxxvi.

31 Ibid., p. 60.

32 Schutz (1966), op. cit., p. 117.

33 Ibid., p. 121.


36 Ibid., p. 83.

37 Ibid., p. 91.

38 Ibid., p. XLI.


40 Ibid., p. 123.

41 Ibid., pp. 123, 124.
42 Ibid., pp. 124, 125, 126.
43 Weick, op. cit., p. 107.
44 Ibid., pp. 57, 58.
46 Ibid., p. 27.
47 Weick, op. cit., p. 39.
48 Krippendorff, op. cit., p. 23.
BIBLIOGRAPHY


Thorndike, E.L. Educational Psychology. New York: Columbia University Teachers College, 1913.


