THE UNIVERSITY OF OKLAHOMA

GRADUATE COLLEGE

THE PHILOSOPHICAL SIGNIFICANCE OF CYBERNETICS

A DISSERTATION

SUBMITTED TO THE GRADUATE FACULTY

in partial fulfillment of the requirements for the

degree of

DOCTOR OF PHILOSOPHY

BY

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Norman, Oklahoma

1969

THE PHILOSOPHICAL SIGNIFICANCE OF CYBERNETICS

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ACKNOWLEDGMENTS

The author acknowledges the assistance, in the preparation of this manuscript, of the following members of the graduate faculty: Dr. Carlton Berenda, Dr. Rudolph Bambas, Dr. Clayton Feaver, Dr. William Horosz, and Dr. Kenneth Merrill.

PREFACE

Cybernetics is philosophically significant in two fundamental ways: Implicit in its fundamental concepts are a model of man and a conceived frame of reference in terms of which a somewhat new treatment of the problems of philosophy can be undertaken. The primary tasks undertaken in this essay are, first, to elaborate a frame of reference and a model, and, second, to treat briefly some basic philosophical problems in accordance with this new perspective.

Cybernetics is also significant for philosophy in that it can be viewed as the latest development in that philosophical school which originated with Aristotle. Because Norbert Wiener, in the introduction to his Cybernetics, discusses the historical antecedents of cybernetics, I have not stressed the development of the discipline here.

I have, however, in Chapter Five discussed the notion of indirect communication in some detail. The treatment is, in this instance, historical, partly because the subject is most easily treated in this fashion and partly because little has appeared on the subject; and consequently, I thought such a treatment would be informative.

My essay is something of an experiment in perspective. Chapter One states the theme of the essay and serves as an introduction to the general systems point of view--first by telling, then by showing. Chapters Two through Five are intended to stand in an interwoven pattern of opposition to each other. Chapters Two and Three are each concerned with an interrelated complex of problems as they primarily relate to the individual--Chapter Two is biased toward a "topside" view while Chapter Three shows a complementary bias for viewing things from the "underside."

Chapters Four and Five form a slightly sharper objective-subjective contrast and, taken together, oppose Chapters Two and Three in that the former are more socially oriented. I must emphasize that I have deliberately undertaken to preserve some degree of objective-subjective and individual-social tension in each chapter, but each has its deliberately created bias. Chapter Six is supposed to resolve these tensions. It is my intention that the reader shall, in the course of reading this essay, undergo from time to time mild shifts in perspective, but I want the focus to remain unclear until the final chapter.

Although the problems dealt with in this paper have occupied my attention for the last fifteen years, the final form did not suggest itself to me until about a month before this essay was written. While presenting a paper on some of the notions contained in the first half of this essay, I

felt constrained to apologize for the loose texture of the arguments. To my surprise, that paper was well received. It occurred to me that there is often a positive virtue to leaving gaps and slightly blurring the focus of at least a portion of a work. Tension is necessary for growth and while there is some tension produced through sharper contrast, it is definitely heightened if the contrast is ever so slightly blurred. Tension can be further heightened by working with more than one contrast of perspectives at once. Thus it is that each of the four internal chapters of this essay lacks internal balance, but they hang together, it is hoped, in mutual support. I have gone to almost absurd lengths to soften the contrasts in the four internal chapters. For instance, I have often avoided the rhetorically sharper "because" in place of "so" in order that the line between causal and logical dependence not be too sharply drawn. Finally, there is an internal-external contrast; it is a contrast of sharpness of focus with respect to perspective.

It is my belief that philosophical "truth" is not to be found in the clear logic of a rigorously drawn conclusion, for it is always the frame of reference in light of which our propositions have their meaning that needs justification. Philosophy thus has more in common with art than with science. It is that subtlety of mind which is exemplified in Laurence Sterne or Honoré de Balzac that is

needed in philosophy, not the heavy-handed, rule-of-thumb thinking characteristic of the logician. The tendency toward homomorphic reduction, which is our way of characterizing general principle, must be resisted when we are in the evaluative stage of an enterprise. How often have you had to deal with the administrator who catalogs you as one of a type and proceeds to interpret your every response in light of this stereotype! "And when I am formulated, sprawling on a pin,/ When I am pinned and wriggling on the wall, ..." In the annotation of one of Capablanca's chess games, I once came across the following passage: "Capturing toward the center is a good rule of thumb; Capablanca, however, does not play with his thumbs?" This is an admirable characterization of intelligence. And it is with intelligence that we must approach our fellow man; I would lay a moral obligation upon every man--it is the moral obligation to be intelligent.

Most of the material in Chapter One, and much of that in Chapter Two, is derived from, or related to, the work of three men: Norbert Wiener, Claude Shannon, and W. Ross Ashby. The world-view which emerges in these first two chapters turns out to be quite Aristotelean, although this fact was only noted after the main outline was constructed. The chief difference with Aristotle is that a commitment to realism is resolutely resisted. The source of this resistance to realism is readily apparent. Anyone

who has even a nodding acquaintance with the philosophy of Ludwig Wittgenstein will perceive his influence as it emerges in Chapter Two and becomes the dominant theme in Chapter Three. Chapter Three could have been called, with some justice, an analytical defense of cybernetics.

Although less readily apparent, the influence of P. F. Strawson, Willard Van Orman Quine, and Ian Philip McGreal is considerable in Chapter Three. The content of Chapter Three is also influenced by John Dewey's conception of the role of context in thought and communication. Dewey's influence persists into Chapter Four, where an extended discussion of B. F. Skinner's Walden Two is used as a vehicle for the discussion of the social effects of social planning. Little needs be said here, by way of acknowledgment, about Chapter Five; explicit references are given in detail. The influence of the men cited above can be noted in Chapter Six.

Although little or no specific mention is made of the following men in the essay, their influence has helped shape the character of my thought; I suspect that the reader will discover many things reminiscent of each in the following pages. I owe much to George Santayana, Alfred North Whitehead, Donold Hebb, Benjamin Whorf, Walter B. Cannon, Friedrich Nietzsche, and John von Neumann. These sources will be cited in the bibliography.

Finally, what follows can be characterized as an attempt to avoid commitment either to the notion that language mirrors the world or to the belief in total cultural relativism.

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THE PHILOSOPHICAL SIGNIFICANCE OF CYBERNETICS

CHAPTER I

THE GENERAL SYSTEMS WAY OF THINKING

> My task which I am trying to achieve is, by the power of the written word to make you hear, to make you feel--it is, before all, to make you see. That--and no more, and it is everything. If I succeed, you shall find there according to your deserts: encouragement, consolation, fear, charm--all you demand--and, perhaps, also that glimpse of truth for which you have forgotten to ask.
>
> Joseph Conrad

This essay is concerned with the philosophical significance of a scientific discipline--cybernetics.[1] It is not primarily concerned with (1) the science itself, (2) its application to technology, or (3) the socio-ecological effects of cybernetic-inspired technology. It will, of course, be necessary to describe some of the basic notions of cybernetics, but this description will be as sketchy and brief as possible.

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[1] "Cybernetics" comes from the Greek word for steersman. See Norbert Wiener, Cybernetics, or Control and Communication in the Animal and the Machine, 2nd. ed. (Cambridge, Mass.: M.I.T. Press, 1965), p. 11.

Cybernetics, as I see it, carries with it a point of view--a perspective--from which judgments will be passed on the significance of all human activity. Such judgments will, of course, be expressed in language and will have to do with language--our symbolic frame of reference. Thus, from a point of view conditioned by the concepts of cybernetics, we shall judge the philosophical significance of linguistic behavior. Now, linguistic behavior is a form of human activity; and the philosophical significance of any human activity is what that activity, in its global sense, does to the symbolic frame of reference of those people engaged in that activity and, derivatively, how those people, so altered, will affect others.

It seems that, already, I am asking you to do something paradoxical--to judge the significance of cybernetics from a perspective conditioned by cybernetics. But, is it paradoxical to say, "Put on these glasses and then speculate about how putting on these glasses will affect men both singularly and in the aggregate"? One may certainly question the legitimacy of the analogy; could one, for instance, speculate about the effect of taking knock-out drops while under the influence of knock-out drops? No, I do not say my analogy holds, but it may; and so, we avoid the certainty of paradox, if not the possibility. I shall now endeavor to guide you into the perspective of cybernetics.

Cybernetics, as I shall present it, is concerned with describing the behavior of systems in terms of the states of those systems. This description of the behavior of a system is generally undertaken as a prelude to altering that system's behavior. Cybernetics, then, aims at the description of the behaviors of systems with respect to manipulatable parameters.

Wiener defines cybernetics as "the science of control and communication in the animal and the machine."[2] I do not think it improper to extend this definition to other systems, e.g. plants, societies, populations, etc. Cybernetics is both particular and general. Attention is first focused upon a system, a particular system, defined in terms of its states, but then a search for generality takes place; that is, not one but all the possible behaviors of that system are sought. We thus ask for a general or complete description of the behaviors of a particular system. Cybernetics seeks generality on another level in that it also attempts to elaborate a body of concepts suitable for talking about any system whatever.

Now, it is easy to see that information theory is a necessary part of cybernetics. Information theory is always concerned with a set of possibilities, not with individual events. Cybernetics, employing information theory, attempts

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[2]See footnote 1. This is the subtitle of Wiener's book on cybernetics.

to set up a way of describing all the possible behaviors of a particular system in terms of a language, or conceptual scheme, suitable for describing any system whatever.

How does cybernetics differ from older ways of doing science? Cybernetics represents a new point of view, and so new problems naturally emerge. But there is more involved here. In addition to seeing new problems, there is an emphasis upon looking for different ways of structuring problems within this new perspective. Confronted with the phenomenon of a frog zygote developing into a mature frog, the classical scientist would ask how this development takes place. He will then look for intervening states, and, since he cannot immediately observe them all, he hypothesizes them, guided by some analogous mechanism from his experience in other situations. Gradually, a grand mechanical picture or model, which is said to represent the state of affairs under investigation, is built up. This model or theory is then subjected to tests to see if it can be verified. For instance, in our frog example, it might be hypothesized that both the concentration of chemical X in the water and changes in temperature will affect zygote development. It can be put somewhat like this: If chemical X is present then the zygote becomes a cyclops, and if the temperature falls below $35^{\circ}F$ the zygote becomes a tadpole, but change is arrested at this point. Both of these developments set

off new searches for mechanisms to explain why these new phenomena are manifest, and so on.

Confronted with this same situation, the cybernetician will ask, "What are the possible states the zygote can go to, and what can I do to obtain one of these states?" His attention is not focused upon a search for mechanisms or upon any attempt to reduce or explain what goes on here in terms of something else. His point of view is radically functionalistic. He seeks to define initial and terminal states and to discover some operation performed, or condition imposed, on the initial state such that a specified terminal state is reached. Cybernetics looks at the wider set of possibilities that exists in a given system and asks how one particular possibility may be realized--what we have to do in order to bring a certain situation about. In this endeavor, little or no attention is given to the notions of necessary connection or driving force. It is, we might say, assumed that some kind of change will take place; the big question is "How do we control change--what must we do to insure a given final outcome?"

We might justly characterize the older scientific viewpoint as dealing with systems wherein causal connection or energy transfer is the fundamental concept. (The word "system" shall here mean a clearly delimited portion of the world in which we happen to be interested.) The well defined properties exhibited by the system are just those

responses to well defined changes in the surroundings in which we happen to be interested. It is, I think, accurate to say that these systems are energy-tight or energy-closed, closed either by disregarding certain energy leaks (ignoring friction and air resistance) or by compensating for, and minimizing, energy leaks (insulation, etc.).

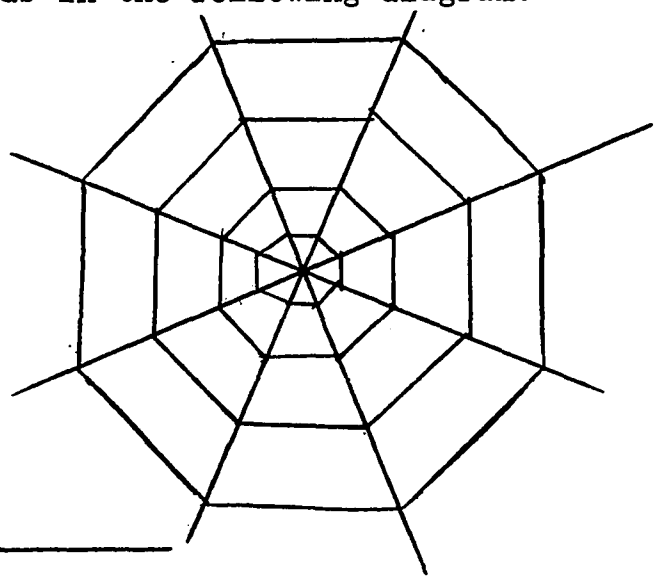
Cybernetics, on the other hand (speaking loosely), may be said to be information-tight but open to energy. That is, some sort of change is always presumed or expected. It is the possible ways that change can go that is of interest to cybernetics. The important thing is not energy transfer but information transfer. Just as the classical scientist wants to insure that no energy moves from one part of the system to another without his knowledge, so the cybernetician wants to determine all signals or information transfers within the system.

Cybernetics, in contrast to the energy oriented viewpoint, has several advantages. Its concepts are perfectly general in that they are applicable to all branches of science: a chemical, physical, psychological or biological system can be described in the same language. Therefore, it offers a way of bringing diverse sciences into relation with one another <u>without</u> <u>reducing</u> one to another. In other words, the whole project of reductionism is side-stepped. Various areas of one special science may be shown to be

isomorphic[3] with respect to areas of another science. Thus it might be possible, if the human nervous system can be shown to be isomorphic with certain complex self-regulating servo-mechanisms, to infer expected human behaviors from machine behaviors. It is important to notice that anyone committed to a reductionistic program would be unlikely to seek these kinds of isomorphic relationships.

One can proceed only so far toward understanding a point of view through general statements. I shall now turn to a specific exemplary problem; I shall try to show, step by step, how one can be led into the perspective of the general theory of systems.

Suppose that one day in my back yard I notice the following phenomenon. A spider has constructed a web such that there are four concentric bands connecting the radial filaments, as in the following diagram.



[3]See the discussion of isomorphism and homomorphism, p. 9.

Suppose further that I have occasion, or indeed just decide, to observe this situation at some fixed interval for some fixed interval--say, every hour I look at the spider-web-system for five seconds. During the intervals while I am actually watching the spider, he is always on one or the other of the concentric bands, never in-between on a radial strand.

Suppose I now write down the number "one" when the spider is on the innermost band; the number "two" when he is on the next innermost band; and so on. In time I will have written down a long chain of numbers from which a matrix showing transition probabilities can be constructed. Let us now imagine that I simply sit down at a wireless telegraph and broadcast this chain of numbers, which I shall refer to as the protocol of the system. The question now arises: What can someone who knows nothing of my circumstances make of this broadcast if he should chance to tune in?

Let us suppose that he extracts the following transition matrix from our number chain.

	1	2	3	4
1	1/2	0	1/8	0
2	0	1/4	5/8	0
3	1/3	3/4	0	1/2
4	1/6	0	1/4	1/2

Our listener might say that the matrix is descriptive of a discrete-state machine operating under constraint and, therefore, in some measure, determinate. The terms "system" and "machine" have this relationship: a richly joined system, one that is determinate, or nearly so, is called a machine; and a loosely joined machine is called a system.

Suppose now that the listener takes it upon himself to construct a machine which will exhibit behavior capable of being described in the matrix he has constructed. Such a machine will be said to be <u>isomorphic</u> with whatever generated the first protocol. Such an apparatus might consist of various sets of coin tosses made according to certain rules.

The listener might also construct a transition matrix where states three and four of the original matrix are regarded as a single state. Such a matrix would look like this:

	1	2	7
1	1/2	0	1/16
2	0	1/4	5/16
7	1/2	3/4	5/8

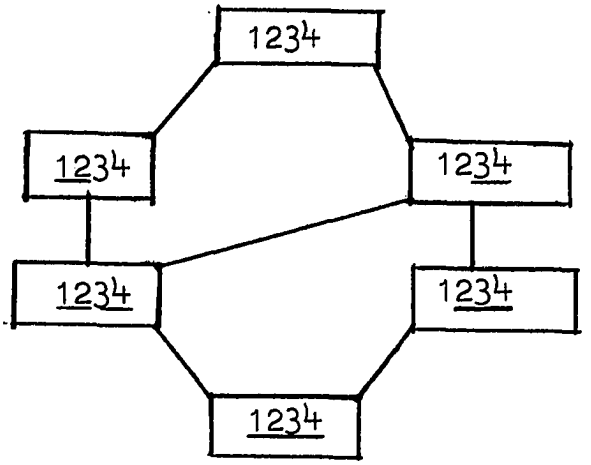
If he constructed an apparatus which exhibited such a line of behavior then the apparatus would be <u>homomorphic</u> with the source of the transmitted variety. Altogether, fourteen matrices descriptive of machines homomorphic with the source

of the transmitted variety can be constructed. Of course, one of these is trivial. The complete lattice is shown on the following page (p. 11).

We see that one can order the kinds of simplifications of a given machine. After the first simplification, we see that state one (1) yields state one (1) and seven (7) with equal frequency. One might now find, after a further examination of the protocol, that if state seven has preceded state one, state one always goes in the next step to state one. That is, seven, one yields one, one. By recoding states so as to take account of previous states, we can sometimes discover a more determinate matrix. We might say that the system shows memory. Such a matrix might look like this:

	11	12	17	21	71	22	27	72	77
11	1	1/2	1/2	0	1	0	0	0	0
12	0	1/2	0	0	0	1/2	1	0	0
17	0	0	0	0	0	1/4	0	0	0
21	0	0	1/2	0	0	1/4	0	0	0
71	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0
72	0	0	0	0	0	0	0	0	0
77	0	0	0	1	0	0	0	1	1

11 and 77 are absorbing states.


1234
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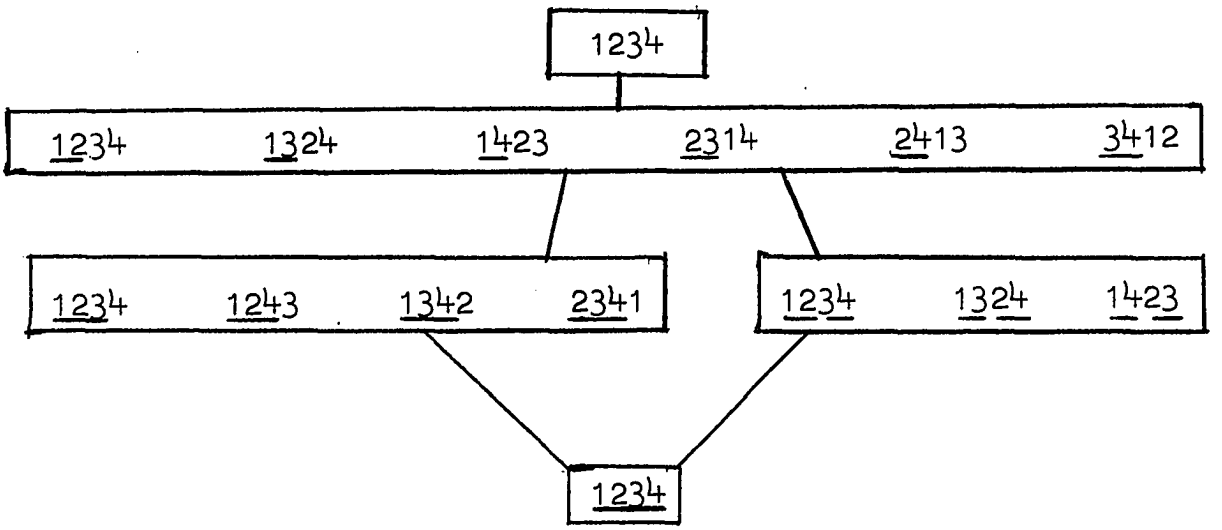

1234
1234 1324 1423 2314 2413 3412
1234 1243 1342 2341
1234 1324 1423
1234

Now suppose I discover that, while an ultrasonic whistle is sounding, the spider moves to the first strand and remains there until the whistle ceases, whereupon it resumes its former behavior. Here, we have a machine input: whistle sounding or whistle silent. If I now shut off the whistle whenever the spider reaches the first strand, and turn the whistle on whenever the spider reaches the fourth strand, we have a system with feedback in which I am coupled to the spider-web-machine through the whistle-optic channels.

If we now suppose that our listener lives nearby and has a dog that howls whenever he hears the whistle, the listener might notice that the dog's howling accompanies a change in the behavior of the wireless signal. He may set up a second matrix which describes the signal's transition probabilities when the dog howls. It might turn out to be:

	1	2	3	4
1	1	1	0	0
2	0	0	3/4	0
3	0	0	0	1
4	0	0	1/4	0

We can see that the system quickly goes to state one and remains there; one is now an absorbing state.

Our listener could, however, code the situation as:

	A1	A2	A3	B2	B3	B4
A1	1/2	0	1/8	1	0	0
A2	0	1/4	5/8	0	0	0
A3	1/3	3/4	0	0	0	0
B2	0	0	0	0	7/8	0
B3	0	0	0	0	0	1
B4	1/6	0	1/4	0	1/8	0

A = Whistle Silent B = Whistle Sounding

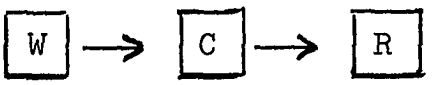
I have now introduced the notions of: (1) a determinate machine (in this case, stochastic), (2) the machine with input, (3) the partially coupled system or interacting systems, (4) the fully joined system, or system with feedback, which can, by choice of variable coding, be treated as a simple determinate machine. I have also introduced isomorphism and homomorphism, made possible by simply recoding states. Finally, I have noted that a third type of recoding is possible, when we take into account previous states of a machine. If this kind of recoding makes the system more determinate in its behavior, we say the system shows memory.

So far we have made use of the notion of variety without explicitly attending to its importance. The very notion of communication, or information transfer, depends upon variety or, at any rate, upon the possibility of variety. Three other important notions can be introduced

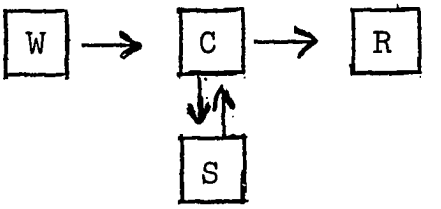
through a brief discussion of variety--control, constraint, and uncertainty.

Let us suppose that my four wireless signals consist of one, two, three, or four dots with a long interval between each signal. Also imagine that someone (S) wanted to interfere with my signal's ability to carry information without immediately arousing a possible listener's suspicion. If he also has a wireless key, he need only wait for my signal, and in all cases where I send less than four dots he reduces the variety in the channel to zero. He has robbed it of any capacity to carry information.

We view the situation as follows: Before S interferes, the spider-web system (W) is a machine with output, the receiver (R) is a machine with input, and the wireless is a coupling (C), a machine with input and output.



When S interferes, C has two inputs with S's input determined by C's; thus, there is feedback from C to S.



S keeps the output of C at R constant, thus acting as a <u>control</u> on R and a <u>constraint</u> on C; that is, S reduces the variety in C to zero. Note that S could impose lesser

constraint on C. He could, for instance, take no action when one dot is sent but always add to two or three dots so that the signal adds up to four. Here the constraint imposed reduces the variety from two bits to one.

Before S intervened, the total variety transmitted by C could be described by two binary digits; the greatest amount of information that could be transmitted at one operation is two bits. It is now possible to introduce H--the basic information function--which is, variously termed, depending on use, the amount of either information, surprise, uncertainty, selection, or, generally, negative entropy. In our case, H shall specify uncertainty. We may think of uncertainty as specifying the receiver's expectation of guessing wrong about a given message before it is sent. Uncertainty (in bits p) is given by the formula $H = \sum p \log_2 p$ and can never exceed the possible variety of the system, in this case, two bits. It will only equal this variety when each message is equally probable. Suppose that each state: one, two, three, or four dots, appeared equally often, then $H = .5 + .5 + .5 + .5 = 2$ bits--the variety in the system. If, however, the four different states appear with a frequency of .10, .14, .36, .40; then $H \simeq [.3322 + .3971 + .5306 + .5288] \simeq 1.7887$. R's uncertainty is thus reduced by approximately .2113 bits.

One last point: A channel can carry more than one message. If the receiver notes the difference between

no signals and some signals then S would not interfere with the transmission of this information.[4]

I shall now endeavor to treat some metaphysical, epistemological, and ethical problems, more or less in the order mentioned here. We turn, first, to what can be called metaphysical problems.

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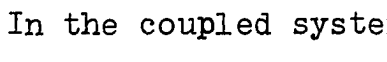
[4] In large measure, the ideas expressed in this chapter derive from the works of Norbert Wiener, Claud Shannon, and, most of all, W. Ross Ashby. For general reference consult the bibliography.

CHAPTER II

SOME PROBLEMS FROM THE STANDPOINT OF CYBERNETICS

> Lass dich die Bedeutung der Worte von ihren Verwendungen lehren! (Ähnlich kann man in der Mathematik oft sagen: Lass den Beweis dich lehren, was bewiesen wurde.)
>
> Ludwig Wittgenstein

We shall now consider the interrelated philosophical problems of freedom, substance, consciousness, certainty, and continuity. What if someone asked, "Are the states of the system we have been discussing free or determined?" It seems to me that the only way we can find a use for the terms "free" and "determined" is to pay careful attention to what system we are talking about.

In the coupled systems  antecedent states of C are followed by subsequent states of R. One can say C determines R, but C is free with respect to R. Likewise, W is free with respect to C, and R is determined with respect to C. All of these subsystems are completely defined--they are defined in terms of their states. If someone asks, "Is W determined?" we can quite rightly reply,

"No, of course not--we have not, up to now, connected antecedent states in some other systems with subsequent states in W." (Note that we could just as well use the terms "cause" and "effect" here.)

In the last chapter we attended to only one kind of variety that a spider is capable of exhibiting--the way he moves about on a web. Let us substitute a man (M) for the spider. Suppose that our protocol was extracted from four different activities of a man; say he alternately laughs, talks, barks, and chews on a bone. If we now succeed in discovering a set of well defined antecedent states in the environment which precede each state the man exhibits, we can say that he is determined. We are here concerned about the man's coupling, on the one hand, with his environment and, on the other, with the wireless. Thus, M is defined in terms of his states. Someone might here exclaim, "But M so defined is not a man; you have selected out only a very minute portion of the enormous number of behavioral states a man might exhibit." I would reply, "Nevertheless, M is the site of the variety which concerns us--for our purposes, M is only that and nothing more. Also, for our purposes, M is now determined."

There is a related use we might make of "free" and "determined" here. We could think of a system as free when it exhibits maximum entropy--when the occurrence of each state is equally probable--when the system shows no

constraint. If M laughs, talks, barks, and chews on a bone in completely random fashion, we might say he is free.

It is important to notice that the quantity of variety in a system will depend on our coding. If we, for instance, define a man as living or dead then the variety will be one bit.

Suppose, however, we defined man according to the permutations of the firings of the cerebral neurons; assuming neuron independence, the figure is something like $(10^{10})!$. Can I determine a given state among all of these? Of course, I could achieve this by killing the individual involved. I can also reduce the variety by cutting out certain portions of the brain, but this act, one might say, alters the system and we do not have a man anymore. Here we could, with profit, employ the old skeptic's hair-splitting argument. The arbitrary character of our definition can be brought home when our questioner sees that his definition of a man depends upon the firing of one neuron. This procedure is, as always, absurd; we do not use the word "man" in this way.

But our questioner might have something else in mind--he might want to know if we can reduce entropy without altering the possible variety. We should observe, first of all, that maximum entropy cannot, as a matter of fact, occur in a human cortex. The cells are not totally independent of one another as to their firing. But, this aside, the

pertinent question is, "Can we functionally reduce entropy to zero in a human cortex--can we completely determine the sequence of firing of the neurons?" The answer is, obviously, "No--not now at any rate."

In order that a system be able to determine another, the determining, or control, system must possess as much variety as the system controlled. Furthermore, control can only be effected if there is a channel which possesses the requisite variety, i.e., as much as the system to be controlled. Now, the major difficulty in controlling the human cortex lies in the inadequacy of any channel. Even the largest computer possesses only a small fraction of the requisite variety for controlling the human cortex. But, let us turn now and work back to freedom by way of substance and consciousness.

At the outset of our investigation, one might have been prompted to ask: "Why did you happen to note just this kind of variety in the spider's behavior? Why, for instance, did you not notice how he placed his feet or moved his fangs?" I am inclined to reply that I can give no final reason or rule here. In the end, I simply notice that some feature of a situation captured my attention (this I will call abstracting). I can, of course, offer hypotheses and may decide to accept one of them, but I could not operate here according to a rule. How, when the possibility of variation is infinite, can a rule be formulated in advance which

will specify what kind of variety will be attended to? The rule must cover all possibilities.

At any rate, one will grant that we always do notice certain aspects of a situation and that we do, indeed, note certain regularities concerning these aspects; this much was clear to Aristotle.[1] In some sense, then, we always operate with black boxes. One can easily operate with the fact that a press on the buzzer brings the secretary without making any analysis of intervening aspects of the situation. If one were to become concerned with bells and electrical

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[1]The term substance plays essentially the same role in this paper that it does in the philosophy of Aristotle. Aristotle said, in the Posterior Analytics, "It is necessary that there should be some unity that may be truly predicated of the many things" (I. 11), presumably because, from the Metaphysics, "Unless there were something over and above the individual things there would be no object of reason, but all things would be merely objects of sense" (II. 4). Aristotle also said, "Of sensuous substances taken individually there is neither definition nor proof possible, because they possess matter, and the nature of matter is such that it is possible for it to be, and, also, not to be" (Met. VI. 15). But although neither definition nor proof is possible for sensuous substances, sensuous, or concrete, substances are the indwelling form in conjunction with matter (Met. VI. 11). Thus substance played a dual role in the philosophy of Aristotle. Aristotle's sensuous substances are simply given in experience--the indwelling forms present themselves. And the indwelling form must exist in order that there be an object of reason.

Aristotle's admonishment (Met. VIII. 4) that we seek proximate causes is also in agreement with the present work. When an explanation is called for, our explanation is to be given in terms of that which is proximately primitive. For example, an adequate explanation of a dog's behavior may require a description of dog flesh; it does not require a description of prime matter. Likewise, in systems theory, a system is to be understood in terms of its immediate states or subsystems, not in terms of some ultimate analysis. See also my reference to Aristotle's use of cause in Chapter Five.

circuits, he would, first, be dealing with a different situation, and, second, at some level, still be dealing with black boxes. The elements of a system are for that system black boxes. We can take account of more aspects, but then we have a different system.

But it is not the black box of substance that most concerns us; it is the black box of consciousness. It seems to me that it is most beneficial to treat the problem of consciousness as a double-aspect problem, which may be loosely referred to as objective-subjective. First, let me develop the objective aspect. Here, I will be considering persons other than myself.

It is difficult to separate the problem of "abstracting" from what is done with abstractions; I have already said something about the former. That aspect of my discussion, in the last chapter, involving an observer-sender and a listener, was designed to enable me to separate, if only artificially, these problems. One is not as likely to ask, "Why do you distinguish among these four signals?" or "Why do you notice this signal?" as he is to ask, "Why did you notice that the spider behaved thus and so?" By focusing the discussion, for the time being, upon the listener, I can, perhaps, persuade you to consider only what can be done with abstractions, or perhaps you would prefer the term essences.

For the listener, when the source of the variety is unknown, the machine under consideration is the machine-like behavior. The signals carry information to the receiver by eliminating possibilities or removing uncertainty. The signals mean something for the listener in that they reduce his uncertainty as to what is to follow. When one begins to receive information from different systems and notices connections between these systems, as in our example when the listener both receives the wireless signal and hears the dog howl, new dimensions of meaning emerge; and the listener is able to connect one kind of variety with another. The dog's howl now means that the electrical signal will shortly show a different pattern.

I hope you will see where this kind of thinking leads. The "man" one thinks about is a line of behavior together with what that line of behavior means for the observer.[2] It is easier to get a clear view here if we adopt an omniscient point of view with respect to the object and the subject.

Shannon's law of requisite variety[3] demands that if one system is to take complete account of another, the

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[2]See B. F. Skinner's Verbal Behavior (New York: Appleton-Century-Croft, 1957) for an extended discussion of this point of view.

[3]For our purposes, the best discussion of Shannon's law of requisite variety is that by W. Ross Ashby, An Introduction to Cybernetics (New York: John Wiley and Sons, 1966), pp. 202-18.

accounting system must have as many states as the system accounted for. If our listener is to receive the signal then he must be thought of as a system capable of at least four states; if he is simultaneously to receive information through the dog channel, he must possess two additional states; and if he is to code the two as interacting systems, he must possess at least eight states. If I am to say that the signals mean anything for the listener, he must exhibit additional variety. He must show that he anticipates some future state of the signal on the basis of its present state.

As a system is able to map more and more fields of variety into itself, there exists the possibility that it may also map the inner-connections of these fields into itself. And always, it seems that such mappings of inner-connections lead to a more determinate representation.

What then can individual (X) be for individual (Y)? X is for Y only those states of X mapped into Y together with what these states mean, in that they point to systems beyond X or affect how Y anticipates future states of X. The statement, "X is conscious," means for Y that the system X is in a particular state; and if the sentence is to convey any information, there must exist the possibility that X might be unconscious. The statement, "X's unconscious mind is not accessible to X's conscious mind," suggests to Y that one system of variety is not completely mapped into another. Y's model of X might be that of a system capable

of mapping enormous quantities of variety into itself. In addition, a portion of the system not involved in this first-order mapping, maps, abstracts, and recodes a portion of the received variety. As a sidelight, we can point out that this model of man allows us to account for those feelings about other people for which we can give no reason. The first-order mapping is of a finer texture than the second-order mapping. Consequently, some of the variety is lost in the second-order mapping. How we <u>feel</u> may be considered as the result of first-order data processing. How we <u>think</u> may be regarded as the result of second-order data processing. We know, as a matter of experience, that neither feeling nor reason is a sure guide to action where people are concerned. The failure of reason can be interpreted as due to a failure to make sufficient distinctions or judicious distinctions. The failure of feeling can be attributed to a lack of system coherence.

But what of the subjective aspect of consciousness? Can the consciousness of Y ever be the subject of that consciousness? In the first place, for Y the statement, "I am conscious," carries no information--there is no possibility that Y could be conscious of the statement, "I am conscious," and at the same time, it be the case that Y is unconscious. We note that Y can say nothing about Y's consciousness. Another person (X) might take Y's utterance as a <u>symptom</u> that Y is in the conscious state. And X might say to

another individual (Z) that Y is conscious, and here, information is transferred.

We might, at this point, be interested in something other than the linguistic question; we might want to ask, "Can an individual ever be conscious of the nature of his own consciousness?" According to our model of man, set forth here, this question is equivalent to "Can a system monitor itself completely?" From the standpoint of cybernetics, this latter question can be answered with an unequivocal "No!--the notion is contradictory to our model." According to the law of requisite variety, a monitor must possess as much variety as the system monitored, and if this is so, nothing would be left over to monitor the monitor circuits. No system can at the same time be isomorphic with itself and take cognizance of that isomorphism. Of course, one part of a system may monitor another part, and so partial self-knowledge is not ruled out. The foregoing does not rule out the possibility that someone else might be able to take complete account of me--assuming that he can show more states than I.

Thus for me, my consciousness remains an essential secret. I cannot know what I am going to do next, if by this I mean know completely the next state I, as a system, will go to. This amounts to saying that for myself, I must remain undetermined or free--and this statement again says nothing when I say it to myself. There is no

possibility that I might be determined. For another person, my consciousness indicates only some state I might be in or some subsystem organization associated with that state. If he is a sufficiently complex system and can take the proper read-offs, he might completely determine (predict) my actions. In practice, he must, however, work with some extremely crude homomorphic reduction, which is usually less adequate than the partial isomorphisms in my own "conscious" systems.

I shall attempt to deal with the problems of certainty and continuity by, first, constructing, on a broader scale and with less detail, a more complex model and, then, explicitly posting the observer outside the system; when I define a system according to its states, I had best not pay attention to myself when I do it. Let us suppose that we are watching system A take account of system B.

How can we give meaning to the statement, "System A takes account of system B"? After all, when we take account of B, we take account of only one abstract protocol emitted by B; even if for someone else it is capable of a greater degree of variety than for us, nevertheless, for us he is what we can abstract--what may be homomorphic for someone else will be isomorphic for us. The system will then, in some sense, always take "complete" account of the system monitored. Here, we come up against the most difficult problem for those who opt for phenomenology--the world is in

every case my world. The problem is how do we account for the fact that we realize that we may be wrong?

Suppose that A and B both monitor a third system C. A and B both encode C in the same way--they make the same distinctions with respect to C. A has enough states to map C in the same way B does. By way of digression, and in addition, A is so constructed that second-order monitoring circuits map the entire encoded protocol of C so that C is treated as one of several subsystems.

Let us suppose that C is a chicken. A's map of the chicken will include many, many states which the chicken can go to. In addition, there will be ways in which chickens differ from each other.

Suppose A's map of these different chickens (say C, D, and E) is as follows:

C	D	E
UVWXY	UVWXZ	UVWXR

A can code C, D, and E as states of a larger system, say Q; and Y, Z, and R indicate states of Q.

Let U, V, W, and X be variables which have a range of two states--U, for instance, can be U' or U". U' might be wings extended, U" wings closed, and this kind of variation is possible to all three chickens. Let Y, Z, and R stand for colors--white, red, and black, respectively. Wing-flapping is a state of C; being white, red, or black is a state of Q. <u>In each case the system is defined in terms of what is free to vary</u>.

There is also a protocol of B mapped into A, and this includes B in the presence of C--the entire range of B's responses to change of state in C. For A, B and C are now one determinate machine. When we say A takes account of B, it is the encoded protocol and nothing more that is accounted for. A might also possess sufficient states to map other systems very similar to B in the same way he has done in the case of C; B, R, and S might form a system. A can now take wider account of B with respect to a larger system.

If there is no feedback from B to A and if B's responses in no way affect A, then it is senseless to speak of A being in error with respect to B. But it is almost always the case that B will in some way feed back into A, and what if A's map is wrong? The present map A has of B is never wrong as far as A is concerned. But, A can say that his map of B is possibly wrong, and this simply means that B may emit an unexpected response. This problem requires for its solution that there be a third-level feedback loop in A which maps cases of being right and wrong about systems. A's map of B now includes B changing its states X, Y, Z, and W, for example; but also, B's not showing these states. Alternately, where these states are not shown, the system under consideration is called not-B. One might even say that for A, B has broken down.

The point is, absolute certainty applies only to models or, if you prefer older terminology, forms, essences, or abstractions. This does not eliminate the possibility that someone may, in fact, be certain even though he entertains the notion that he might be uncertain.

The problem of how the matter of continuity might arise in a finite-state machine is very similar to how the notion of certainty is so mapped. Suppose one watches a stick being cut in half and one of these pieces again halved and so on. First-order mapping takes account of sticks and their states wherein finite numbers of cuts are made. Second-order circuits map these maps; third- and fourth-order mapping describes the possibility of future cuts and takes cognizance of this possibility. Continuity, thus, is a feature of high-level mapping--it is a part of the grid we place on the world, and, of course, the grid itself is <u>our</u> world; only for someone else is it a grid placed on the world.

This, then, is our map of man: He is an enormously complex, finite-state machine wherein first-order maps are mapped in turn into second-order maps, as in our example of the chickens. But there are many different kinds of second- and third-order maps arising from those of lower order. The system cannot in principle take account of itself completely. This is our way of accounting for the fact that our

knowledge is determinate, that one takes account of uncertainty, and that we are essentially free.

While a good case can be made for the assertion that all problems of philosophy have both a metaphysical and an epistemological aspect, it is, nevertheless, easier to deal with most philosophical problems as though only one aspect were involved. In Chapter Three, the focus will shift toward problems of knowledge--the orientation is more "inward" than is that of the present chapter. A similar perspectival shift occurs between Chapters Four and Five.

CHAPTER III

LINGUISTIC PROBLEMS

expression is the need of my soul
i was once a vers libre bard
but i died and my soul went into the body
    of a cockroach
it has given me a new outlook upon life
i see things from the underside now

Don Marquis

Our whole conception of how one man exists for another--that for X, Y exists as the encoded protocol of a line of behavior--involves us in some interesting linguistic considerations. The signals which X picks up concerning Y carry information in that they render more determinate either the model X has of Y or what state Y is actually in. X is informed by the signals in that the signals eliminate possibilities. The signals mean something to X in that he can by linking his model of Y with other models he has encoded, or by linking states of Y, reduce his uncertainty about what is to follow. The signals can inform and have meaning only because they are interpreted or fitted into some pattern. Information has to do with making a particular

model more determinate. Meaning has to do with how this determination in one model affects determination in others.

Suppose, for instance, we know that Smith, Jones, or Thompson is a dope peddler. We learn that Jones is not a dope peddler. The second statement is informative; it reduces our uncertainty. The two statements together mean that either Smith or Thompson is a dope peddler.

Meaning is absolutely dependent on context. When we have learned the meaning of a word we have learned an entire system of symbols. And in addition to a linguistic context, an extra-linguistic context is also present when we make use of an expression. The notion of use is inextricably interwoven with meaning. Another way of expressing ourselves here is to say that meaning has to do with a system's orientation toward other systems. Symbols are of use to a relatively stable system, like a man, in that they enable the system to maintain stability. Communication can now be thought of as a process wherein one system orients another system. Words and other signals thus become, in their primary function, operators. Consider the following example where one system orients another:

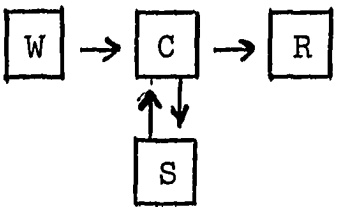
Suppose a child walks into my garage and asks me, "What is the use for that tool?" Now, suppose further that the tool he is inquiring about is used for things with which he is totally unfamiliar. In this case, I can show him all the ways I use the tool by using it in various

operations. The child can now practice these operations for himself, and when he can use the tool in all the ways I have shown him he knows as much about its use as I do. It is almost as though I had taken him by the hand and led him through a segment of forest pointing out various landmarks, and soon he is able to find his way about in this section of the woods as well as I. Of course, if the child in question already knows something about the adjacent territory, he will be able to make better "use" (in a wider context) of what I am showing him. Now suppose I show him a relief model of the landscape we are traversing and attempt to employ this model as a learning aid, and suppose he does not see the connection. Perhaps the model is too rough. (And here, perhaps, is a way we can come to understand the most primitive use for the word intelligence.)

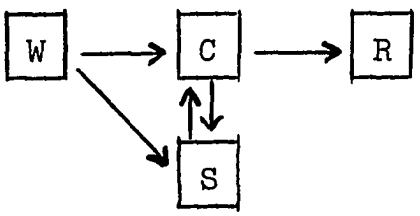
The situation of the child in the garage is quite similar. He, at the end of our training sessions, provided I am successful, will be able to find his way about, to operate with a set of objects. He can, in like manner, be taught to operate with certain words. Suppose in our training session I have made use of some diagrams, and have taught the child likewise to make use of them. Will he or I be disturbed because a section of the garage floor has been used to draw a map of the garage? Will he insist that my map on the floor will need, for its completeness, to show within it the position of the map, and this second-order map

to show a map and so on? What have these second- and third-order maps got to do with the use of the map? They certainly do not help us in locating the first map. Of course, it is possible that a second-order map could have a use. In ranger stations we do see marked upon the map the position of the station. A second-order map could serve this function, namely, to show us where we are. If someone were to ask, "How do I use this Map?" he would think it absurd if I drew him a map of the map. It is much the same with the meaning of the word "meaning." If someone asks, "What is the meaning of 'meaning'?" I need not stand there puzzled by the form of the expression and attempt, as it were, to give a map of the map. I can simply try to show him how the word is used, and I do this by means of analogies, models, demonstrations, and so forth. It may be that I will not succeed in showing the uses of this word to my questioner <u>simply because he already knows those uses that I put before him</u>, and in this case he will often not be able to see that he has asked the most useless question in the world. Perhaps the hardest job in the world is that of showing someone that he has indeed asked a useless question. It is similar to the case where one asks, while holding a map in his hand, "Where are the directions for finding the map? They are not here."

In Chapter One, the notion of control was discussed in conjunction with the diagram:



The output of C at R remains constant due to the intervention of S through the feedback loop C-S. Suppose that our source of variety (W) is a thug whose input signal at C is a set of knife thrusts which if not interrupted will increase your surface area beyond accepted limits. S now becomes your control center whose inputs at C are your possible counter actions. Since S requires a finite time in which to select the appropriate counter action, S may not possess the requisite variety if all its information is obtained at C. If, however, there exists another channel from W to S (let us say that you watch the position of the thug's feet), part of the work of selecting the appropriate response is done before W's signals reach C, and, now, perhaps S will possess the requisite variety for maintaining stability in R.



Verbal communication is closely akin to the situation where the thug inadvertently signals with his feet. Verbal signals affect the control center; they affect its orientation. It is also possible that one system can bring

about an entire rearrangement of another so that different patterns of data interpretation are set up. This is something which the system acted upon cannot in principle anticipate the nature of. This kind of indirect communication is, from my point of view, philosophy. As Wittgenstein says, philosophy "leaves everything as it is."[1] There are no facts of philosophy; philosophy has to do with our frame of reference.

A short discussion of conflict theory will at this point serve two purposes. First, it will enable the reader to acquire familiarity with the way of thinking about the nature of communication and language implicit in our general systems image of man. Secondly, conflict theory will make our discussion of meaning, from a general systems point of view, easier to grasp.

Let us suppose that Leroy and Elwood are playing a very simple game using the table shown below.

		Leroy	
		X	Y
Elwood	A	1	3
	B	2	1

The rules of the game are: Elwood selects a row; he has two possible choices, Row A or Row B. Then, Leroy selects a

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[1]Ludwig Wittenstein, Philosophical Investigations, trans. G. E. M. Anscombe (New York: Macmillan, 1965), p. 49e, para. 124.

column, either X or Y. The intersect of the row and the column is the outcome of the encounter. Let us assume that Leroy desires the outcome (1). If he has knowledge of Elwood's choice, he can always insure the outcome of (1).

Suppose now that Leroy must specify in advance what his strategy will be in response to any move Elwood makes. If Leroy's aim is to secure a minimum of outcomes, if he wants to reduce the variety, then he will specify X in response to A and Y in response to B. If, however, we increase the choices open to Elwood, as in the following game, Leroy will not have complete control.

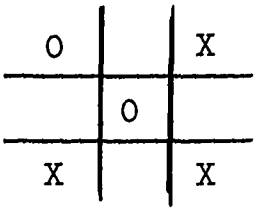
		Leroy	
		X	Y
Elwood	A	1	2
	B	2	3
	C	3	4
	D	4	5

We see that Leroy does not possess the requisite variety to completely control the outcomes. The best he can do, where no rows have identical elements, is to hold Elwood to an outcome of 2 or 4. Of course, if both 2 and 4 are acceptable outcomes, then Leroy's control is sufficient unto the problem thereof.

The key to a general understanding of conflict theory can be grasped by noting how a chess master beats a computer at the game of chess. He wins by complicating the

game to the point where the computer cannot cope with all the variety.

Another kind of overloading is exhibited in the following tic-tac-toe game:



O cannot move to block the double threat; he does not possess the requisite variety; he has only one move whereas two are required. Thus a system must possess requisite variety with respect to information, data processing, and response potential. If overloading occurs at any stage, the system can no longer maintain control.

Enough has been said about conflict theory to show its relevance with respect to the notions of uncertainty and information as they bear on the transactions a system has with its environmnent. Conflict theory also points the way to an understanding of how the meaning of our expressions are rendered determinate. Briefly, our problem in communication is limitation of outcome. The meaning of signals cannot be divorced from their use. In fact, when we have taught someone the uses we have for an expression, we have taught him its meaning.

There is an intimate connection between the two statements: "For me other men are machines," and "Can machines think?" Subsequent discussion will demonstrate

this relationship. There are four important objections to the legitimacy of the expression "Machines think." First, there is an ethical objection--is it good for men to think this way? Second, there is what I shall call Gödelism.[2] The objection here is that a machine cannot exercise independent thought, or cannot think thoughts which are not those of the programmer. The third kind of objection is that the machine cannot be self-conscious. The fourth objection is appropriately labeled Ryleism. Here, it is maintained that to say machines think is a category mistake, a violation of ordinary usage. Let us take Ryleism first.

Can machines think or feel? Would we ever be inclined to say of a machine that it thought or felt? Is it logically possible for a machine to think? This last question draws attention to the critical issue. If I say, "Machines can't think," and I mean by this that nothing could count as evidence that a machine thought, I have, by a semantic decision, rendered it impossible for the expression "the machine thought . . ." to function in our language. It is a violation of protocol to use "machine" and "thought" in this way. It is a violation of a formation rule--which can now be called a rule since it has been made explicit. The

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[2]I do not mean to imply that Gödel himself ever gave any thought to what is discussed here; only that what his proof seems to imply has been used by others to formulate a position. See J. R. Lucas, "Minds, Machines and Gödel," Minds and Machines, ed. Alan Ross Anderson (Englewood Cliffs: Prentice-Hall, 1964), pp. 43-59.

expression, "The machine thought that it was in love but didn't feel that way," is, after our rule has been explicitly posited, not a well-formed formula, and this is why we can say that it is logically impossible for machines to think.

But what if no such rule has been set forth? Doesn't the use of "machine" in the expression, "The machine thought," seem strange anyway? We might say here that this expression violates customary usage, but how do we determine what customary usage is? "It seems to me that this expression violates usage." Doesn't this statement seem a little arbitrary and self-centered?

I could also make the statement, "Russians do not think," into a "necessarily" true proposition. I simply decide to use some other expression, or expressions, besides "think" when I talk about Russians. Where someone else might say, "Tolstoy thought that he had won the game," I might say, "Tolstoy exhibited a positive anticipatory response set at one point in the game," or some other such expression. Does it not seem strange to use two different sets of expressions with respect to Russians and other people? But--hold on--who said Russians are people? If I were to adopt the procedure of not using "thought" with respect to Russians, I might feel some inclination to alter the usage of other terms when I talk about Russians.

When you say, "Machines can't think," exactly what are you telling me? Are you saying something about machines or something about the way you use language? If it turns out that nothing can count as evidence against the statement, then you have simply told me something about your language habits. Sometimes it takes a little while to find out if someone is "telling" or "showing"--telling us something about the world or showing us something about himself.

If someone says, for example, that "widespread, unprovoked violence is not exhibited in any society," we might, at first, think he is saying something about society. But upon reflection, we discover that we, ourselves, would not call any group of people a society if there were widespread, unprovoked violence exhibited. We find that our speaker has not only told us how he uses words, but that we agree with him in that usage. There is, then, basic agreement at the pragmatic level where usage is established informally. We can also agree to prescribe a given usage. This is agreement at the semantic level. This usage we take as saying something about machines. If we do not agree with this usage, we say it tells us something about the speaker. In point of fact, however, in this particular case, we have some feelings of puzzlement. For a long time, we have used the word "think" with respect to certain forms of complex behavior exhibited by people. It just happens that no other things around us exhibit these complex behaviors. We

might say that a dog "thought," but even here we seem puzzled. Is asking, "Can a dog think?" a question about dogs or about linguistic usage? At any rate, we have usually reserved the term "thought" for people.

Until the present time, there has been little trouble with the use of the word "thought," since no other organism except man exhibited the complex behavior that we refer to when we say so and so thinks. But now machines have begun to exhibit complex behavior which makes some people want to say they think. The trouble is "our linguistic habits are out of joint." A distinction is called for where one was heretofore not needed. In James' example of the men who argued over whether or not the man goes round the squirrel, we have something similar.[3] Once James showed that, while we normally do not have to distinguish between circumnavigating an object and being at different times oriented toward its different sides, we see that here a distinction is called for. Two different usages which have in the past accompanied each other have to be separated.

I have so far pointed out that: (1) We can, by a semantic decision, make it logically impossible for a machine to think. (2) I have also indicated that we would not feel too uncomfortable with this decision because our actual linguistic habits have not been offended--we have not

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[3]William James, "What Pragmatism Means," Essays in Pragmatism, ed. Alburey Castell (New York, London: Hafner Publishing Co., 1966), pp. 141-58.

in the past used "think" and "machine" together. (3) I have further indicated that it would seem odd to us if someone said that "Russians don't think" and have indicated that this is due to established language habits. (4) I have said that in the case of dogs, as with recent machines, we waver. (5) Finally, I have indicated that we do waver in our usage because the kinds of behavior exhibited by dogs, and some complex machines, overlap the behavior range of man--at least, to some extent. In connection with this, I have said that James' squirrel problem can help us to see that the overlapping of spheres of usage is the cause of our trouble. Now what if the range of a machine's behavior exactly overlapped man's?

Suppose we could construct a mechanical man whose skin, eyes, etc., were indistinguishable from a man's. Suppose further that he had all the facial expressions right--in short, that we could not in any way distinguish this machine from a man either by behavior or appearance. I have no doubt that we would say the "man(?)" thought, and even if we knew that it was mechanical, in time we would either say, "Of course machines think," or possibly "Some machines are men," which is another possible linguistic adjustment we could make. Or suppose that we were to remove most of a man's cortex and install radio control equipment wired directly to the sensory and motor nerves of the brain. If this equipment were in contact with a big enough computer,

say one the size of a medium-sized house, we could probably get people to say that the individual so controlled thought, but they would probably abandon this usage if the situation were explained.

It seems that what we do say about "thinking" or, indeed, most any word, depends upon customary usage and that what we might say depends on what definitions, semantic decisions, we make. One wants to say that at least the law of contradiction stands firm--of course it does: it is a formation rule of logic. "One cannot 'logically' hold contradictory opinions." Of course not--this is precisely the point. Contrast the law of contradiction with the "necessarily" true hypothetical statement, "If A is the cause of B then A precedes B." This statement "feels" just as true to me as the law of contradiction.

We can definitively undermine Rylean objections to the expression "machines think." First, we note that while conformity to ordinary usage is necessary for communication, there is also embodied in ordinary linguistic usage a procedure for changing some one or more features of usage. If I say, "Let us henceforth use the term 'think' in conjunction with machine," then if people agree to this usage there is no possibility of a Rylean objection, for the expression now conforms to ordinary usage. And, there is no need to justify, in general, the process of altering customary

usage; it is simply a fact that this procedure is used, and furthermore, customarily used.

Alternately, what if I say, "Let us think of men as machines," and other people agree to this usage. Now the Ryle people will have a difficult decision to make. Either "think" will no longer be legitimately used with "man" and, for all practical purposes, have no use whatever, or "machines think" will become a legitimate expression.

As I have already said, arguments against the legitimacy of the statement "the machine thinks," which are associated with Gödel's proof, are arguments designed to show that a machine cannot think what is not programmed into it or that human thought is essentially different from machine thought. It is my belief that the subsequently presented argument is one big category mistake. The argument runs like this:

I. Any deductive system which is both consistent and rich enough to produce arithmetic contains at least one formula not provable in the system. Nevertheless, we can see that these formulae are true.

II. It is maintained that any machine which is complex enough to be suspected of thought is an instantiation of a formal deductive system, obviously containing simple arithmetic since it can do simple arithmetic. It follows that since we can see that some formulae, unprovable in such a system, are obviously true, and since the machine

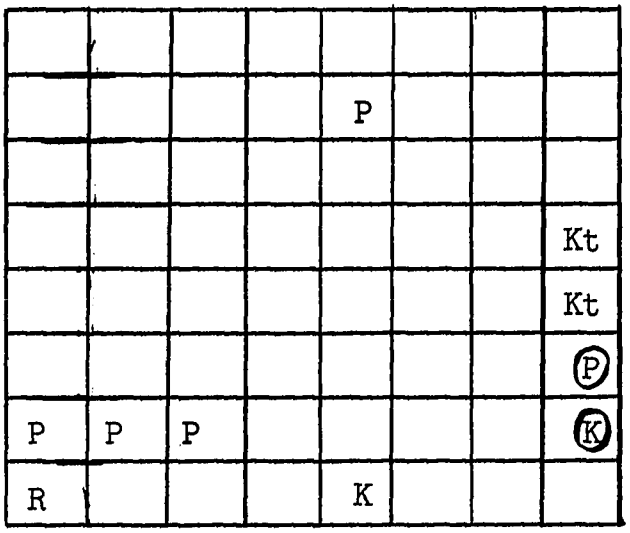
is no more comprehensive than its deductive system, human thought is essentially different from anything a machine might do.

In the first place, I will point out that even if we accept this characterization of a machine, this "essential" difference is something very trivial. What we can contemplate, in all its splendor (and which the poor machine never can), is the formula which says, "This formula is unprovable in this system."

What is of much more importance, however, is the fact that this conception of a machine is completely wrong. The conception of the machine held by the Gödelians is that it is completely determined in its operations by a set of rules and that what it does will always be something definite and discrete because anything indefinite would not be machine-like. Well, is this not the very model of a machine which I have been holding up for you all along? How, you may well ask, can I escape the conclusions so rigorously deduced from our conception of a machine and Gödel's theorem?

It is fortunate, indeed, that I am defending cybernetics as a metaphysical principle; only this makes a defense possible. Suppose you are playing chess and you, with black, are in the following position:

Black



White

(Black pieces are circled)
(Neither the white king nor rook has moved.)

Suppose your opponent offers to bet you five hundred dollars that he can checkmate you in two moves, and you, after checking the position, accept. Later, as you are writing out your check for five hundred dollars, you might begin to have some valuable thoughts. After all, it is hoped that you will get something for your money.[4]

Or, suppose that someone offers to bet you two thousand dollars against one thousand that he can beat a "fair" roulette wheel. You agree that he is to play the wheel for one hour, and at the end of that time if he is ahead you pay; otherwise, he pays. Are you smart if you accept this bet? A <u>little</u> knowledge is a dangerous thing.

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[4]White plays: pawn to king eight, rook; black any; white castles (using rook on king eight), checkmate.

Experiences of this type can lead one, after a time, to construct models of a different type. You include in your model of the situation the possibility that there is something you have not seen. You learn caution--like the Greeks with their possible "God unknown," you consider the possible "state" or "variable unknown."

While I abstract models from situations, the point of the above discussion is that the model may be incomplete. I have already explained elsewhere how our cybernetics model of man makes this possible. Even if I built a machine constructed to operate according to certain rules, still I include in my model the possibility of the unexpected. Suppose the machine surprises me--well, then I will construct another model of it, a different abstraction.

We act the same when dealing with a man or a mechanism. We construct a model, but our model, if we have much experience with life, also has room for the unexpected; we realize that we may have to modify our model. My world is in every case my world--it is as I see it. This is all very true, but my world is a very contingent world. Although I am certain of my own ideas, as my ideas, I am also certain that the possibility exists that I will not have the same ideas tomorrow; this is an undeniable fact. But then, isn't Husserl right after all? Maybe we do intuit essences which are there for everyone. How can we entertain the notion that someone else abstracts a different model from a given

situation? Can we imagine his seeing the situation in some way in which we do not see it? We must say "yes" and "no" here.

Any definite model which we can attribute to someone else must, of course, be one we possess; but we learn, if we live long enough, to expect "our world" to change. It is an undeniable fact; Descartes would say that "'I think, hence I am' is true every time I pronounce it." Yet, in a way, I can entertain the possibility that from some completely alien frame of reference even this pronouncement may be nonsense.

The Gödelians are held captive by an idealized picture of a computer working exactly as the designer planned for it to work. They would see things more clearly if they began by considering a servo-mechanism instead of a computer.

Suppose that X has devised a way of reading Y's thoughts and that he is able to derive a set of rules which perfectly predict Y's behavior. Has X thereby robbed Y of that something special; has X stolen Y's mind? Does it follow that X can now rely on the set of rules which he has formulated about Y and feel perfectly confident that Y will never surprise him? If he has lived his entire life in the academic world, he might think so; but anyone with any practical intelligence will know that X must always keep open the possibility that he may be surprised. This is not only true of humans but of machines as well. But, when we

are surprised, what do we do? We build another model; we are made that way--it's in our hardware.

What now about the problem of consciousness? I have already shown that our cybernetics image of man reveals consciousness as it refers to someone else--to his behavioral states. Here, we can use consciousness to label the behavior of a machine. Someone might ask me at this point, "Keaton, don't you feel a little strange saying, 'a machine is conscious?'" Suppose I reply, "Yes, I do feel strange." But, is this feeling anything more than something occasioned by my linguistic habits? Suppose a child grew up in a world where machines behaved in many ways like men. Would he not say, "Of course, machines are conscious," and think nothing of it.

If these responses do not satisfy you, let us try another way. Suppose I were to ask you, "How do you know other people are conscious--that they have that feeling of consciousness?" Can you give me satisfactory criteria for determining if another person is conscious and feels?

Let me suggest the following: Imagine that I can predict every action of someone else--that I can calculate his reactions in advance. Also, I have completely elaborated a model of him and have programmed a computer so that it is isomorphic with the system I consider him to be. Now, suppose that I can take direct read-offs--that I am literally wired up to both the individual and the computer, and in

each case, whether I am attending to the man or computer, I feel or experience sensations which are in perfect agreement with the report of the "person(?)" under observation. In what way can it now make sense to say I do not experience what he experiences? If you were to deny these criteria as adequate then how can "experience what he experiences" have any meaning? I feel sure that most people would accept my criteria, and if they do, how could they avoid accepting the same criteria if a machine were the subject of an investigation? The point here is that any criteria which would be capable of establishing that another man thought or could feel would also be capable of establishing that a machine could feel. And once we have criteria, the whole thing becomes, in principle, an empirical matter.

Of course, even if we someday have the technology to test both man and machines by these criteria and if it is discovered that men can pass and no machine can, this will not obviate the fact that men of our times do, in fact, act as though other men are, with the qualifications I have made earlier, determinate machines.

The ethical objection derives its force from one of the most fundamental concepts of cybernetics itself--the concept of feedback. Briefly, the objection is that the widespread acceptance of the general systems image of man will disrupt that system which we call society. Is social life possible when man is viewed as a determinate machine?

An answer to this question can best be attempted after we have considered just what is the nature of society when considered as a system. This is the subject of the fourth chapter.

CHAPTER IV

GENERAL SYSTEMS: ITS SOCIAL REPERCUSSIONS

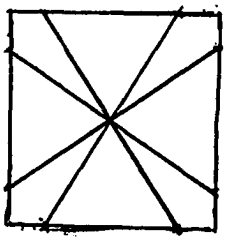

Fig. 1

> Give the party you suspect the above figure and ask him to pick out a form from it.
>
> If he pick [sic] out either of the two crosses below (Fig. 2) you may accept him as a friend, but if he chooses such a form as Fig. 3 it is wiser to shoot at once.
>
> W. H. Auden

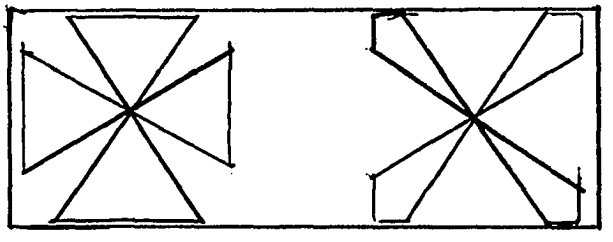

Fig. 2

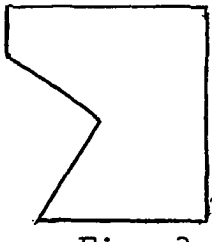

Fig. 3

What will be the likely effect of the general systems way of thinking upon society? Is positing general systems theory self-vitiating? If the general systems point of view is neither logically nor practically self-vitiating, then is

it a way of thinking that is desirable, and if desirable, by what criteria? Finally, aside from these questions, will we be able to keep this mode of thought from eventually dominating our society?

Before we attempt an answer to these questions, let us consider the psychological, philosophical, and historical antecedents of the general systems mode of thought. Psychologically, the systems view may be thought of as growing out of the causal view. At some time in most everyone's intellectual development, it will seem crystal clear that everything must have a cause; he will reason in terms of cause and effect. He may come to justify this reasoning as a habit of mind, as a necessary way in which the mind structures experience, or as an inherent, efficacious principle operative in the world. A person may, however, be led to modify his thinking when he begins to consider the notion of multiple causation. A causal explanation of a specific instance of deviant behavior given by a behavioral psychologist, a psychoanalyst, a sociologist, an anthropologist, and a physiologist may have almost no resemblance to each other. One can think of many instances from his own experience where causal explanations from different perspectives have cast a pall of confusion over an issue.

One of three courses is usually followed at this point. First, one can reaffirm his faith in causality and, while realizing that all the explanations offered may be

inadequate, nevertheless, decide to act upon the hypothesis that one of them is adequate. He acts simply because in some circumstances action of some sort is called for. On the other hand, one may say that perhaps all these causal explanations, offered in terms of different interpretational systems, are translatable one into the other. He may assume the possibility of isomorphism among systems. The tendency to indulge in this latter response is weakened in anyone who knows about that interesting little development in physics called "equivalence of systems." Finally, one can say, "Well, all explanation is relative to our projects"; speculation is dismissed with that shop-worn catchword, "Everything is relative."

Another kind of response is possible when, for instance, I look at a tree. I can think of it as a biological system. I can imagine the flow of water through the xylum tissue; I can imagine the flow of sugar in solution through the phlom; I can visualize the exchange of carbon dioxide molecules from the atmosphere to the leaf surface. Do I even need the notion of cause here at all? Likewise, when I encounter someone who behaves in an abnormal fashion, I can visualize a dynamic system engaged in an ongoing process wherein most of the activities are repetitive in nature. I don't need cause here either. Alternatively, I can think of the tree as an element in its own biome and of the complex interaction of parts within an

ecological system. The shift of perspective here is accomplished by focusing on organization of entities rather than attributes of entities. The tree is an entity when we do ecology; the tree is a system when we do plant physiology. But surely, one wants to say, the tree is the same thing no matter who looks at it. Remember, for us the relevant thing is a line of behavior. For the physiologist, the tree will exhibit a line of behavior. For the ecologist, the tree is a variable, or state, in some line of behavior.

"But how," someone may ask, "is what you say about the systems approach different from the 'every causal explanation is relative' view?" This variety of causal perspective is indeed the closest, of those discussed, to the general systems theory, but there are three important differences. First, as already pointed out, general systems does not even employ the notion of cause. Second, from the outset our attention is directed to a system and not toward the perspective of the onlooker. The orientation is <u>objective</u>, not <u>subjective</u>; we are concerned with what we see, not with how it affects us. This difference is crucial; it is, for me, the difference between the objective and subjective points of view. And from the general systems point of view, the subjective response would here involve one in impossible difficulties. The "inward gaze" may be far better "than the Classics in paraphrase,"[1] but it involves the perceiving

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[1]From Ezra Pound's "Hugh Selwyn Mauberley," ("Life and Contacts").

system in endless, repeating feedback loops which tend to disorganize the system. Whatever system we look at, we had best not attend to ourselves when we look.

Third, we do not attempt to explain either how it is that certain kinds of systems present themselves to us or why it is that one perspective engages us. It is here that we opt for empiricism. This is the level of brute fact; certain things force themselves upon our attention. Even if we were to indulge in explanation here, the brute fact that certain features stand out is absolutely crucial; as Whitehead said, "I'm here and you're there and there is no getting around that."

Our preliminary question, "How can society be characterized as a system?" can now be answered. All we have to do is look and see. Metaphysically, we can decide to view some aggregate of people as a society and give general explanations after the fact in terms of system theory; but are there features of any aggregates of people which force themselves upon us, and, more important, can we set forth a particular system which will predict rather than merely explain? If we are to have anything beyond explanation, we must clearly delimit elements and social facts. This latter has to do with making a science--explanation characterizes metaphysics; prediction characterizes science.

It is quite obvious that the elements of a society are people, and no one doubts that people interact; hence,

we are forced to conclude that there are social facts. A task of fundamental importance is characterizing society and social facts. This is, of course, largely the task of the sociologist, but I would like to think that "enlightened" speculation, such as I shall exhibit in the concluding chapters of this essay, will be of some value to sociologists in their quest for social facts.

Philosophically, cybernetics may be regarded as a fusion of three dominant currents of western thought--rationalism, empiricism, and nominalism. Rationalism is given its due in the realization that our models are absolutely determinate. Empiricism is satisfied in the realization that for us these models are unquestionably facts. Finally, nominalism enters the picture when we formulate a model of a system modeling yet another system. We then see that for us an entirely different model might well have been extracted, and yet, we also see that the limitations of the accounting system preclude its extracting any other model. When we see all this, we are led to entertain the notion that for us the situation may well be the same. Except for this nominalistic aspect of systems theory, it would almost exactly accord with the position of Alfred North Whitehead. Whitehead emphasizes the organismic and holistic approach to philosophy, but his insistence on the whole rather than a whole, delimited with some purpose in mind, shows his predilection for rationalism. For cybernetics,

there is no fallacy of misplaced concreteness. The concrete, or, better, the discrete, is in every case simply the units of a system, and if we in turn look at these units as systems then they are no longer concrete. But does not this view lead to utter conceptual chaos? No, we are saved because we note that certain systems are presented to us. There is this character of givenness to experience. But then, how do we escape essentialism "a la Husserl"? Well, we say, "It does seem that certain systems naturally present themselves to us, and as far as we can judge, if such judgments make sense, they are pretty much the same for everyone." But we hasten to add that there are, in every case, differences; and, anyway, things just happen to be this way--they need not be.

Cybernetics' temporal, although perhaps not genetic, antecedents lay in the thinking of economists, biologists, sociologists, and psychologists. Thomas Malthus' famous essay on population depicts an error-guided, self-regulating system. It is common knowledge that Malthus' notion that a population is limited by its food supply, together with the ideas that there will be competition for available food and that chance variation in progeny will give advantage to one type over another, gave Darwin his mechanism for organic evolution. But organic evolution is based on serial causality rather than closed chain, feedback-loop, antecedent-consequent event-linkage. Malthus had a conception of a

system which would today be characterized as stable and self-regulative. Darwin understood how this limitation imposed by the system would alter the units of the system--the animal species. Darwin only barely misses the concept of ultrastability. Later, Pareto characterized society as a system in dynamic equilibrium, again self-regulative, and Dewey's interpretation of the reflex arc is clearly characterizable as a feedback mechanism. B. F. Skinner's conception of operant conditioning is definitely systems oriented, as I will later show. But all these thinkers missed the great generality of their concept. True, they did conceive of themselves as borrowing a model from another person or field of endeavor, but it remained for Norbert Wiener and Claud Shannon to clearly conceive the notion of the general applicability of systems thinking; W. Ross Ashby developed this notion further. It is this feature of general systems theory that is exciting for me; that is, the fact that it is completely general.

I shall now attempt an answer to the questions posed at the beginning of this chapter. B. F. Skinner's book, Walden Two,[2] is essentially speculation about a general systems approach to social organization, although, of course, he does not so describe it. This book provides me with a specific example of systems thinking, the discussion of which will provide answers to my opening questions.

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[2](New York: Macmillan, 1962.)

Walden Two is about a group of people who establish a colonial living arrangement. Behavioral engineers (the planners) attempt to shape the conditions of life within the colony so that maximum efficiency is achieved in coping with the chores of daily living--the routine maintenance functions of eating, house cleaning, waste disposal, etc. The colonists devote an average of four hours per person each day to the business of keeping the colony going. The rest of their time the inmates have for their own use, within the bounds of colonial life.

The colonial situation itself imposes certain limitations upon the freedom of the inmates, but this condition is probably no more limiting than that of our own culture. The important point is: How are they, the people, reconciled with the limitations that the mechanics of their social arrangements have imposed upon them?

In Walden Two the regulative machinery of the society is internalized. The people are in large measure conditioned to like what they must do. Responses such as jealousy and anger, which have neither survival value for the society nor for an individual within the society, are conditioned out. Better stated, conditions are manipulated so that these undesirable behavior patterns do not appear. The process is somewhat analogous to reducing friction in a machine. Efficiency is increased in two ways. In the first place, when an individual does the desirable thing from habit rather

than from the employment of conscious judgments, the higher centers are left free for other activities. Secondly, and more important, in a society in which the values are internalized, the persons in positions of responsibility can be relied upon to act in the best interest of the community, without the inefficient use of double checks and watchdogs, and watchdog watchers to watch the watchdogs.

Another important feature of Walden Two is the experimental approach. No way of doing things is to be considered sacred. One can imagine that, under certain conditions, people might be able to resort to experiments about living arrangements. There is a limit in any experimental situation as to what experiments may be tried. No experiment can be permitted that will totally disrupt the experimental situation, in this case the colony.

Walden Two is a colony organized for efficient living which, it is presumed, will implement, or at least make possible, the happiness of the inmates. Within the colonial structure, social experiments are encouraged, but the preservation of the colony's integrity limits and takes precedence over any experimentation. This situation is not made explicit in Walden Two, but I can not see how it could be otherwise.

The foregoing is a thumbnail sketch of an isolated colony, but what is Skinner's plan for man as a race? Skinner does not give us a complete blueprint, but the

ultimate development that would follow a successful Walden Two would be the proliferation of other similar colonies. No coercion or salesmanship would be needed; other forms of social organization would simply not be able to compete. The mode of life of the race would change, and out of this complex of colonies, perhaps, a new social order would emerge. Skinner does not say anything about the emergence of any society beyond the colonies, but the possibilities are there, and these possibilities scare some of us. Speculation about the form of society that would come out of the whole race's adopting the way of life presented in Walden Two will be taken up again in the last part of this chapter.

When any type of social planning is discussed, two issues of a general and preliminary nature arise: (1) Can man direct his own social development? (2) If man can direct his development, should he, unless he can ascertain the final outcome, envisage and approve the end result?

While the question, "Can man direct himself?" appears to present logical difficulties, few of us doubt, as a matter of fact, that man can be shaped, to some extent, by environmental factors within the control of others, and even, in some cases, of himself. The important thing here is to be sure that the desired results are indeed obtained and not some sloppy approximation of them. When behavioral engineering is undertaken by young, "book-learned"

psychologists, the results are almost always some ludicrous caricature of the desired state of affairs. That man as an individual can, to some extent, direct his own development is beyond dispute when these terms are used in any ordinary sense; we can all think of instances from our own experience when we have directed ourselves. It is true that we can never foretell all the significant changes in our situation or character which will result from a given course of action; nevertheless, within broad limits, self-direction is possible. I am not here concerned about quibbles such as, "Are we the same after we have become something different?"

With those who admit that social planning is possible but who, nevertheless, maintain that we should not try to shape man through his social condition, I have little patience. In the first place, it seems to me that man is such that he will plan one way or the other. If we must plan, why not do it scientifically, with our eyes open all the way? Why leave the direction of society to the politicians and religious quacks who have so triumphantly guided the world into its present condition? Secondly, is there any virtue in chance events? If we want to accentuate randomness, then let us shape up people so that they will be less predictable. Whatever we do, it seems to me that we must do it quickly. By the year two thousand, if the present two to three per cent growth rate persists, there will be six billion people on the earth. I do not think any

other arguments are needed; the situation is no longer critical, it is desperate.

I come now to the last and central question of this chapter: What would happen if Skinner's program, as outlined in Walden Two, were carried out? Mr. J. W. Krutch does not give a favorable prognosis. He believes that Skinner's program would lead to the disappearance of consciousness in man. Without consciousness, would there be any point to survival? A somewhat related objection to Skinner's program is that it would narrow the adaptive potential of the race and thus lead man into overspecialized rigidity, an evolutionary blind alley. Are these objections valid? Would Skinner's program lead to these feared results? First, let me say that I believe Skinner and his critics agree about ultimate values, or ultimate ends! During a panel discussion of "Survival as the Ultimate Value" the following exchange took place between J. W. Krutch and B. F. Skinner:

> Mr. Krutch: "Supposing you should come to the conclusion, as a result of your investigations, that the healthiest and most enduring society was composed of creatures whose responses had become so automatically perfect that consciousness was no longer necessary and would disappear, would you consider this eternally surviving group of unconsciously functioning organisms a result you would envisage with equanimity and pleasure?
> Mr. Skinner: "Yes, I would envisage that result with pleasure; but what I would not is the condition in which that would be the case." [I include the second clause of this reply for

the sake of fairness though I do not think I understand what it means.][3]

For my own part, I wonder if these words "ultimate value" have much utility, but, be that as it may, Skinner's reply, garbled as it is, puts him in the same camp as Krutch, and almost everyone else. Skinner's second clause (which Krutch says he does not understand) means that he would not envisage with pleasure the condition in which survival could be obtained at the expense of consciousness. Skinner's second clause flatly contradicts the spirit of the first and reduces it to a quibble.

If anything meaningful can be said about ultimate values, it appears to me that most people, including Skinner, want man to survive as man. In other words, there are two inseparably linked "ultimate values": survival of the race and survival of consciousness in at least some of the members.

Would the program of Walden Two produce "men?" devoid of consciousness? I am inclined to say, "No." In the first place, suppose that conditions were such that conscious awareness was not necessary for survival. This is no reason to suppose that consciousness would disappear. Only if consciousness were a hindrance to survival would we expect it to be lost. Secondly, I cannot see anything in the program of Walden Two that would lead to loss of

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[3]Joseph Wood Krutch, "Men, Apes and Termites," Saturday Review, XLVI (Sept. 21, 1963), pp. 22-25.

consciousness. Quite the contrary, there are indications that reflective ability would be at a premium. The whole atmosphere of the colony is experimental, including social experiments as well as others. If you are continually tampering with the social machinery, there will be a continual need for everyone in the society to adapt to slightly different conditions. But, "Are not the social adaptations carried out by conditioning techniques, with there being no need for conscious adaptations?" someone may ask. No society escapes interaction with its heritage. Suppose in our guilt-ridden society we decided to get rid of guilt by conditioning the young so that they would still grow up in association with people who did have the capacity for guilt feelings. Interaction between elders and youngsters would produce ramifying adjustments, a large number of which we would not be able to predict. Conditioning could not begin to handle the problem. Its utility as a tool of social adjustment is that it can be effectively used to remedy obvious social ills, not to settle everything in advance.

It is in looking beyond the immediate program of Walden Two as an isolated colony that most concern is aroused. Suppose that Walden Two is successful and other colonies of its type are established, that these colonies, being a more efficient form of social organization, gradually incorporate the whole race within them. What kind of

society, as a whole, will then emerge? Will it be, as Krutch fears, a termite-like society?

It is, then, the long-term effect of Walden Two that causes the most concern. Is this concern useful? Just how far into the future can we infer? A great, great grandchild of the founders of Walden Two would, in all probability, make decisions I could never predict among possibilities I cannot even imagine. What I am trying to say is that we can not wholly predict the outcome of any sequence of events we initiate, within the culture as a whole. The very act of changing the culture will produce men different from us, men whose actions we may, in some measure, predict for a short time; but after that we can say little. Three kinds of indeterminacy prevent long-term predictions: (1) the very mass and fuzziness of socially relevant data, (2) the fact that the planners cannot escape being a part of the plan, thus establishing unending feedback problems, and (3) the fact that tampering with social organization will ultimately put others in a social reference frame which we cannot even imagine.

Still it is possible to plan with a wide margin of error over the short span. Perhaps this can be clarified by analogy. Suppose I am an explorer in a strange country, and before me is a mountain range. I can make conjectures about what lies beyond and, upon the basis of this, make contingent plans, but is there any point in getting bogged

down in long-term plans when contingency is piled upon contingency? Some possibility, the presence of which I cannot even imagine while I stand in the valley, may present itself when I reach the crest of the ridge. As another example, suppose I am a poor young man embarking on a business career. Suppose that I am determined to acquire wealth in order that my children may have social and educational advantages denied me. If I am a reflective person, unlikely in this case, I will realize that I cannot hope to visualize the entire range of possibilities that will be opened to my children, in the event of my success.

Still, in both the above examples, we plan in order to expand our own and others' possibilities. The explorer or the young businessman, when they commit themselves to their respective courses of action, cannot know what the outcome will be.

If the earth is populated by Walden Two's, will man's possibilities be increased? Who can say? Skinner, of course, set up Walden Two with the idea of combating or removing certain obvious defects in our present culture. What, for example, is the point of living if all our time is taken up either in the chores of living, carried out in an exasperatingly inefficient way, or with going through some education mill performing pointless tasks in a perfunctory way so that we may, in part, escape the system? If these obvious evils can be eliminated by a Walden Two, it

then only remains to be decided whether the cure is worse than the disease. No one can say for sure; I do not know if it is even meaningful to talk about probabilities here. It seems to me that all we can do is to work to remove those evils we know, with full knowledge that these acts will create further problems for generations to come. What is wrong with that? Certainly we don't want to take away all their problems. The inmates of the Walden Two's would have problems, problems in large part engendered by their very system of society.

Walden Two would not be an isolated system. The first colonies would exist in interaction with our present culture, which itself will continue to change. This condition of necessary adjustment to the larger culture, and the changes in it, will, in large measure, shape the institutions of the early Walden Two's. As the number of colonies increase and finally predominate, they will then, changed in large measure by their interaction with the culture they are displacing, begin to interact with one another. Who knows what can happen in this kind of situation?

Still, the carrying out of a program such as Skinner envisages would be enormously difficult. I do not think that the followers of Skinner have sufficient intelligence to make it work. If such a colony is ever tried, I suspect that it will fail, and I do not expect any better results from any other plan for racial improvement. Nevertheless,

in spite of probable failure, I think some form of social planning should be tried. What do we have to lose? In a short time, our freedom of action will be narrowed to the vanishing point by population pressure. We are in a position similar to that of a football team which is behind by three points with seconds left to play, the clock running, and no time outs left. But, cheer up, there may still be time for one more long pass.

CHAPTER V

SYMPATHY AND INDIRECT COMMUNICATION

> What is your aim in philosophy?--To shew the fly the way out of the fly-bottle.
>
> Ludwig Wittgenstein

Let us take stock: The basic notions of cybernetics are sketched in Chapter One. In light of these basic notions, introduced in Chapter One, two species of philosophical problems are discussed in Chapters Two and Three. In Chapter Four, additional philosophical problems which arise in conjunction with social planning are considered. It is now time to introduce another problem: In just what sense can we claim that systems theory offers an adequate explanation of phenomena? Three things need to be considered here: (1) the nature of the model and how it is employed, (2) the nature of the kinds of justification we give for its employment, and (3) the nature of that which cannot be explained in terms of the model.

When any phenomenon is to be explained in system's theory, it is to be explained in terms of a determinate machine; and four things are involved in giving an adequate

explanation in terms of a determinate machine. The first is linguistic: we must reach intersubjective agreement about just what the elements of a situation are--a model of the situation must be agreed upon. The second is "substantive": we analyze elements of a situation into sub-elements--our focus changes so that what are elements in the larger system become systems. A third is "causal": we reach intersubjective agreement about how a given state shall determine a subsequent state in our determinate machine. The fourth is "purposive": we view our determinate machine as an element in a larger machine and determine how it is that the possible states of the given machine govern the possible states of the larger machine. It may be instructive, here, to compare these four aspects of systematic explanation with Aristotle's four usages of the word cause:

> Now causes are talked of in four different ways: one cause is the being and essence of a thing, what it is for a thing to be what it is (for the reason why a thing is as it is is ultimately reducible to its definition, and the ultimate reason why a thing is as it is is a cause and first principle); a second is a things's matter and substratum; a third is the source of its movement; and the fourth, the counterpart to the third, is the purpose of a thing and its good--for this is the goal of all generation and movement.[1]

It seems, perhaps, that the only justification which can be given for employing general systems theory is pragmatic. This, at least, I shall claim, but I shall argue for

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[1]Aristotle, Metaphysics, trans. J. L. Creed, Book I, para. 3. From The Philosophy of Aristotle, trans. J. L. Creed, A. E. Wardman (New York, Toronto: The New American Library; London: New English Library; 1963).

a stronger justification. Part of the argument for this stronger justification will rest on what immediately follows --the explication of that which cannot be explained in terms of our finite-state model of man. As a preliminary, let me try to make clear the crucial relation between systems theory and analytical philosophy.

I have argued that many of the problems of philosophy simply disappear when we realize that our puzzlement is engendered by usages of words. It is often the case that getting clear about word usage depends upon the development of some criteria for a given word's usage. I do not mean to imply that our criteria shall settle all future problems about some word's usage. No matter how rigorous our semantic decision, it must be given in words. (The problem of definitions is raised again in the final chapter.) Nevertheless, for given instances a criterion sufficiently precise can be agreed on, and this is known to be the case.[2] The principal value of the techniques of linguistic analysis is that they help us elucidate criteria. The elucidation of criteria greatly facilitates dialogue, which in turn helps us to reach agreement.

From the standpoint of cybernetics, analytical philosophy is a technique for bringing various

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[2]For a discussion of the point of view taken here, see Ludwig Wittgenstein's Philosophical Investigations, trans. G. E. M. Anscombe (New York: Macmillan, 1965), in particular, para. 164.

data-processing machines into synchronization. This characterization of analytical philosophy immediately brings to mind the notions of sympathy and indirect communication. I have said that I intend to develop a stronger justification for systems theory explanations than simple pragmatic considerations. As the reader may already have guessed, this "stronger" justification will be metaphysical. I shall attempt to establish the foundation for this metaphysical appeal by discussing sympathy and indirect communication. In this endeavor, I shall depart somewhat from my heretofore ahistorical treatment.

The scene opens in the eighteenth century. David Hume, Adam Smith, Hartley, and, indeed, most of the Scottish school of philosophy, feeling the need for a foundation for ethics, revived a notion that has roots at least as far back as Democritus, Plato, and, probably, Pythagoras.[3] They insinuated into modern thought the concept of sympathy, or empathy.

For Hume, the faculty of imagination bridged the gap between man and man, and he clearly formulated the notion of reciprocal feedback in interpersonal relations:

> The bare opinion of another, especially when inforc'd with passion, will cause an idea of good or evil to have an influence upon us, which wou'd otherwise have been entirely neglected. This proceeds from the principle of sympathy or communication; and

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[3]Wilhelm Windelband, A History of Philosophy, Vol. I (New York, Evanston: Harper and Row, 1958), pp. 109-32.

> sympathy, as I have already observ'd, is nothing but the conversion of an idea into an impression by the force of imagination.[4]

In general we may remark, that the minds of men are mirrors to one another, not only because they reflect each other's emotions,

> but also because those rays of passions, sentiments and opinions may be often reverberated, and may decay away by insensible degrees. Thus the pleasure, which a rich man receives from his possessions, being thrown upon the beholder, causes a pleasure and esteem; which sentiments again, being perceiv'd and sympathiz'd with, encrease the pleasure of the possessor; and being once more reflected, become a new foundation for pleasure and esteem in the beholder.[5]

Adam Smith felt that we could imaginatively project ourselves into another's situation, and in some measure feel what he feels:

> As we have no immediate experience of what other men feel, we can form no idea of the manner in which they are affected, but by conceiving what we ourselves should feel in the like situation. . . . By the imagination we place ourselves in his situation, we conceive ourselves enduring all the same torments, we enter as it were into his body, and become in some measure the same person with him. . . .[6]

The arguments for sympathy are from analogy and appeal to plausibility: (1) It appears that we do, to some degree, communicate our emotions. (2) Physically and

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[4]David Hume, A Treatise of Human Nature, ed. T. H. Green, T. H. Grose, Vol. II (London, New York: Longmans, Green, 1898), p. 205.

[5]Ibid., p. 152.

[6]Adam Smith, The Theory of Moral Sentiments, 11th ed., Vol. I (Edinburgh: Printed for Bell and Bradfute, 1808), pp. 2-3.

behaviorally, people are much alike. (3) It can be observed that if two similarly tuned stringed instruments are in close proximity and one is played upon, the strings of the other will vibrate in unison (sympathy) with the strings of the played instrument. There is some likelihood that a similar sympathy exists between men. In the absence of other equally plausible theories which would account for the apparent communication among people, the doctrine of sympathy had great appeal for nineteenth-century thinkers.

At the time Kierkegaard came to intellectual maturity, the notion of sympathy was much in the air. Literary figures in England and Germany made much use of it, among them Wordsworth, Coleridge, Shelley, and Goethe. The utility of sympathy lay in its accounting for, or providing an explanation of, communication. The emphasis was not at first upon establishing contact with the world, or with establishing truth. It was much more a tool of communication than a key to metaphysics.

Indirect communication is a way of breaking down the barriers between men, and it can succeed only if it establishes sympathy. The Romantics were well aware of these circumstances, but they did not grasp all of the difficulties involved in indirect communication. In René Wellek's discussion of Romanticism, he concludes that the Romanticists "all see the implication of imagination, symbol, myth and organic nature, and see it as part of the great

endeavor to overcome the split between subject and object, the self and the world, the conscious and the unconscious."[7] Sympathy was a means of breaking down the barriers between men, but the Romantics, especially Wordsworth and Coleridge, extended the concept of sympathy to include animals and nature.

Wordsworth was interested in the sympathy which can be established between men, but he was more interested in the general sympathy between man and nature. Nature, for Wordsworth, became a shaping force in the development of the adult. "Ode. Intimations of Immortality From Recollections of Early Childhood," "The Prelude," and "The White Doe of Rylstone" reveal Wordsworth's ideas on the shaping powers of nature through sympathy.

Although the word sympathy is used only once in "Ode. Intimations of Immortality From Recollections of Early Childhood," written in 1803, I think that the concept of sympathy, and especially imaginative sympathy, is basic to the poem. Wordsworth speaks of "primal sympathy," which is used to emphasize the link between what the adult has and what he had as a child. This can be felt partially through memory, but primarily through sympathy. The poet can imagine what the child feels, and he can receive impulses from nature through sympathy.

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[7]René Wellek, "Romanticism Re-examined," Romanticism Reconsidered, ed. Northrop Frye (New York, London: Columbia University Press, 1964), p. 132.

In "The Prelude," Wordsworth uses the French Aristocracy as an example of what happens when men disregard their common humanity:

> A light, a cruel, and vain world cut off
> From the natural inlets of just sentiment,
> From lowly sympathy and chastening truth . . .[8]

Wordsworth turns to the heavenly and feels we can transcend through sympathy with nature and natural objects to the spiritual:

> --the consciousness
> Of whom they are, habitually infused
> Through every image and through every thought,
> And all affections by communion raised
> From earth to heaven, from human to divine; . . .[9]

Further, Wordsworth describes the theme of "The White Doe of Rylstone":

> Where anguish, strange as dreams of rest-
> less sleep,
> Is tempered and allayed by sympathies
> Aloft ascending, and descending deep,
> Even to the inferior Kinds; . . .[10]

Coleridge was more interested in the psychology which made possible indirect communication through sympathy between man and man or man and nature. Colleridge was interested in the means by which the sympathetic imagination could develop and come to realize meanings which could not be conveyed by

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[8]Poetical Works of Wordsworth, ed. Thomas Hutchinson, rev. Ernest de Selincourt (London, New York, Toronto: Oxford University Press, 1961), Book IX, ll. 349-51, p. 559.

[9]Ibid., Book XIV, ll. 114-18, pp. 584-85.

[10]Ibid., ll. 42-45, p. 312.

words alone. Coleridge's poem "To William Wordsworth" is probably the best description of this indirect communication. In the following lines, Coleridge states that, due to the imagination, the poet, Wordsworth, has conveyed more than words alone can communicate:

> . . . thou hast dared to tell
> What may be told, to the understanding mind
> Revealable; and what within the mind
> By vital breathings secret as the soul
> Of vernal growth, oft quickens in the heart
> Thoughts all too deep for words!--[11]

Although they probably could not have influenced each other, Hawthorne's notions of sympathy and indirect communication were close to those of Kierkegaard. Evidence of this can be seen in Hawthorne's short stories (e.g. "Ethan Brand") and The Scarlet Letter.[12]

Kierkegaard did not need metaphysics, but he did want to communicate. He felt himself in possession of the truth, but of a truth the very nature of which almost

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[11]Samuel Taylor Coleridge, "To William Wordsworth," The Poems of Samuel Taylor Coleridge, ed. Ernest Hartley Coleridge (London: Oxford University Press, 1960), ll. 6-11, p. 404.

[12]A further discussion on Hawthorne's use of sympathy can be found in Roy R. Male's essay "Hawthorne and the Concept of Sympathy," PMLA, LXVIII (March, 1953), pp. 138-49. The interrelated notions of indirect communication, point of view, sympathy, and the absurd receive extensive treatment in the works of Hawthorne's friend, Herman Melville. These notions are related in the following way: Shifts in perspective occasioned by successful indirect communication produce in one the feeling that the world is absurd, grotesque. Melville's "Bartleby," "Benito Cereno," and passages in the "Encantadas" should be consulted here.

precluded its communication. I believe that Kierkegaard's fantastic insight into the nature and the difficulties of communication came about because he was not involved in discovering objective truth, but focused almost his entire energy upon the problem of communication.

It is his technique and not his truth that I find interesting. In many ways he went far beyond his predecessors, contemporaries, and most, if not all, of his successors in his awareness of the problems of communication.

The doctrine of sympathy, while it no doubt served as the ground out of which many of Kierkegaard's ideas grew, was much like a musical theme on which he expands and varies. There are at least six somewhat overlapping aspects in which Kierkegaard can be seen as reinterpreting and expanding the doctrine of sympathy: (1) With Kierkegaard, the emphasis is more on the sender than on the receiver. He is more concerned with bringing another to see the world as he (Kierkegaard) sees it than with merely apprehending another's point of view. Not that he neglects this aspect; it is indeed necessary to understand another reference frame if we are intelligently to alter it. Kierkegaard can already, in this aspect of the problem, be seen as having a sounder grasp than his predecessors. He views both sides of the issue and is actually trying to direct another, rather than merely passively understand him; he strives to understand

primarily to influence. (2) He is interested in bringing another literally into the same emotional state or referential standpoint as himself rather than merely inducing him to imagine himself in this condition. The imaginative attempt is encouraged in the reader primarily for the effect it will have on the emotional state. Kierkegaard is amazingly sensitive to moods and how they condition our thought. (3) Kierkegaard brings up the point that the mode of communication should reflect that which is communicated. To sympathy, he adds harmony or congruence.

> Something wonderful has happened to me. I was caught up into the seventh heaven. There sat all the gods in assembly. By special grace I was granted the privilege of making a wish. "Wilt thou," said Mercury, "have youth or beauty or power or a long life or the most beautiful maiden or any of the other glories we have in the chest? Choose, but only one thing." For a moment I was at a loss. Then I addressed myself to the gods as follows: "Most honorable contemporaries, I choose this one thing, that I may always have the laugh on my side." Not one of the gods said a word; on the contrary, they all began to laugh. From that I concluded that my wish was granted, and found that the gods knew how to express themselves with taste; for it would hardly have been suitable for them to have answered gravely: "Thy wish is granted."[13]

(4) There is no sharp differentiation between mood and thought, or idea and emotion. They run together in a smooth ongoing sequence. The sender uses words to create a mood.

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[13]Søren Kierkegaard, Either/Or, trans. David F. Swenson, Lillian Marvin Swenson, rev. Howard A. Johnson, Vol. I (Garden City, New York: Doubleday, 1959), pp. 41-42. More of the same can be found in pp. 68, 69, 70 of Concluding Unscientific Postscript, trans. David F. Swenson, Walter Lowrie (Princeton: Princeton University Press, 1941).

In the nexus of this mood, thoughts can evoke emotions, the thoughts being evoked by words. (5) The sender is, when in direct conversation with someone else, ever sensitive to feedback. This reflective character of interpersonal relations is well described in my first quotation from Hume, but Kierkegaard shows this process in action; he gives us a demonstration in the "Diary of the Seducer." (6) Since Kierkegaard's orientation is active rather than passive, it lends itself to an experimental approach in interpersonal relations. These experiments will not only help the sender make decisions about the case at hand, but will also train him in manipulative technique. Kierkegaard, of course, could neither experiment nor make use of feedback in his writings, and I can well understand his scepticism about being able to lead others into the way of the truth.

The doctrine of sympathy, as well as Kierkegaard's indirect communication, assumes that people are very much alike in basic structure. This raises a small problem. If people are so much alike, why can't they communicate directly? Why don't words always mean the same thing to everyone speaking the same language ("same" is used in two different senses here)? I think a case could be made here for the position that people are very similar in structure, but are made different by environment. Our problem here is to provide a corrective for the environment so that others will see things as we do.

Kierkegaard distinguishes between an essential and an accidental secret. An accidental secret is instantly understood when it is revealed. On the other hand,

> when Socrates isolated himself from every external relationship by making an appeal to his daemon, and assumed, as I suppose, that everyone must do the same, such a view of life is essentially a secret, or constitutes an essential secret, because it cannot be communicated directly. The most that Socrates could do was to help another negatively, by a maieutic artistry, to achieve the same view. Everything subjective, which through its dialectical inwardness eludes a direct form of expression, is an essential secret.[14]

This, then, is Kierkegaard's problem in the Postscript: he is in possession of the truth, and this truth is essentially a secret. The essential truth is subjective, contained in a view of life, and at times equated with a view of life. The teacher or sender can, at best, only bring others to the same view, a difficult and always uncertain task. In the final analysis, the teacher can only hope that he has succeeded; he can never be sure.

In Either/Or ("Diary of the Seducer") the problem confronting the seducer is similar to, but somewhat different from, that confronting the writer of the Postscript. In this case the seducer is again certain of what it is that he wants to accomplish, but the reason for his action is felt to be an arbitrary choice of the aesthetic in preference to the ethical. The seducer is totally and passionately involved in his task. The passion is largely generated by the

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[14]Kierkegaard, Postscript, p. 74.

obstacles in the way of its satisfaction, by a barrier. The seducer sets himself the task of bringing a girl into the frame of mind necessary to his enjoyment of her. The task of the seducer is different from that of the teacher, but the method of its accomplishment is essentially the same. The chief methodological difference is that the seducer has the advantage of feedback from the girl.

The human situation, as Kierkegaard saw it, is essentially one of isolation. There can be no certainty of contact between men even in the most commonplace conversation. Truth equals subjective certainty, and Kierkegaard is subjectively certain of himself and God and nothing else. I do not know that he actively doubted the existence of the physical world and other men, but I believe he would have said that he could not be absolutely certain of such things.

In a way, Hegel sought what Kierkegaard sought: absolute certainty. Hegel's attempt was to create a system and a method, the design of which would enable one to fit any possible development into the system. Hegel could not know what his system would look like in years to come, but he felt that his method would incorporate anything into his system. Kierkegaard was not happy because the final paragraph had not yet been written, in fact, seeing the finitude of man, could never be written.

> We shall have to abstract from the fact that knowledge of the world-historical is, as a cognitive act, an approximation, subject to the dialectic involved in every conflict between the ideal and the empirical, a dialectic which threatens every moment to prevent a beginning, and after a beginning has been made threatens every moment a revolt against this beginning. The historical material is infinite, and the imposition of a limit must therefore in one way or another be arbitrary. Although the historical material belongs to the past, it is as subjective for cognition not complete; it is constantly coming into being through new observations and inquiries, new discoveries are constantly brought to light, compelling not only additions but also revisions. Just as improvements in the instruments of observation facilitate new discoveries in the natural sciences, so every improvement in the methods of critical inquiry will in the same manner affect the world-historical material.[15]

A somewhat analogous attitude could be taken toward the study of infinite series. A rule can be given for generating a series, but the series is such that it is always possible to write one more term. If the series is limited, it is an arbitrarily imposed limit. The series of natural numbers is a good example of this situation. A man like Hegel would here be satisfied with the rule; one like Kierkegaard would not--he would object that the series was not yet complete, that any proposed completion would be an arbitrary imposition. Moreover, truth is inwardness according to Kierkegaard, and how can the world-historical be internalized? I do not intend to imply that Kierkegaard would reject the enterprise of "discovering" rules for

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[15] Ibid., p. 134.

generating infinite series. I only mean that he would be quite sceptical about what the rule tells us.

We might wonder why Kierkegaard, looking out from this condition of isolation from other men, from society, from nature, and indeed, from everything except God, bothered to write at all. One can say that he wrote only in order that he might thus work out and clarify his thought for himself, but the very manner in which he wrote would argue against this hypothesis. Typically, he thought out a book and then wrote it. In other words, his ideas were clear before he began to write.

It seems plausible to me that while Kierkegaard could not be certain that he could communicate with others, he was also not certain that he could not. He did feel that he could not <u>know</u> that he had communicated, but this does not rule out the <u>possibility</u> of communication. Of one thing we can be reasonably certain: Kierkegaard did not believe that one man could possibly communicate the <u>truth</u> to another! The truth is essentially subjective; by its very nature, it can not be communicated. This does not rule out the possibility that one man may lead another into the way of the truth; but, emphatically, even this is a problematic situation.

It is important to be clear about the communicative situation, what can be communicated, and the nature of

truth. Kierkegaard himself would caution us not to be hasty; we might overlook something important.

If I say to someone, "The pot is on the table," I have neither given him the truth nor put him in the way of the truth. As far as Kierkegaard is concerned, I have attempted to communicate in a problematic way with a problematic entity concerning problematic objects in problematic relations. The truth is, for whomever I am talking to, subjective. How can such things as tables and pots be subjective? The person cannot even be one hundred percent sure of his own sense perceptions; and, for Kierkegaard, anything less than certainty is not equal to truth. The situation is thus: we can possibly communicate with others about problematic external objects and events, but truth is of necessity ruled out of this situation.

We can, possibly, communicate to others words which may, possibly, lead them into a state of mind where they may, possibly, experience the truth--passionate certainty. This leading of another into the way of truth is, if possible, of necessity an indirect communication.

What has been said of Kierkegaard, his philosophy, the historical setting for that philosophy, and Kierkegaard's relations to other thinkers was said with the intention of explicating what Kierkegaard meant by, and how he made use of, indirect communication. The foregoing also sets the stage for an examination of the question: What is

there of value in the concept of indirect communication for us?

If, as some modern philosophers have done, we think of words as serving in semantic, syntactic, and pragmatic capacities, we could say that Kierkegaard used words essentially in their pragmatic function. Just as the animal trainer uses the various stimuli at his disposal to put an animal into a situation where it will evoke a desired response, so Kierkegaard uses words to shape the mood of his listeners, to put them in that condition where they may receive the truth.

Just as the animal trainer may need to establish preliminary conditions such as blocking exits from the training cage, arena, so Kierkegaard is concerned to discredit any proposed alternative to becoming subjective.

Kierkegaard's focusing upon the situation and the use of words within a situation, together with his tacit emphasis on the pragmatic use of words, has, in my opinion, significantly influenced important modern thinkers, among them Heidegger and Wittgenstein.

Heidegger, like Kierkegaard, tries to bring us into a situation where, it is hoped, we will experience some kind of truth. Heidegger believes that if we ask the question, "Why are there essents rather than nothing?" this question can be made to recoil upon the asker in such a way that the ground of the question will be experienced.

> But if this question is asked and if the act of questioning is really carried out, the content and the object of the question react inevitably on the act of questioning. . . . Here it may suffice to say that the leap in this questioning opens up its own source--with this leap the question arrives at its own ground. We call such a leap, which opens up its own source, the original source or origin (Ur-sprung), the finding of one's own ground. It is because the question, "Why are there essents rather than nothing?" breaks open the ground for all authentic questions and is thus at the origin (Ursprung) of them all that we must recognize it as the most fundamental of all questions.[16]

Kierkegaard's influence upon Wittgenstein was important even though Wittgenstein refused to accept his concept of private meaning.[17] Wittgenstein shows his kinship to Kierkegaard in his extreme pessimism about being able to communicate. In the Preface to the Tractatus, Wittgenstein says, "Perhaps this book will be understood only by someone who has himself already had the thoughts that are expressed in it--or at least similar thoughts."[18] Later, in the Investigations, he repeats his pessimism: "It is not impossible that it should fall to the lot of this work, in its poverty and in the darkness of this time, to bring light into one brain or another--but, of course, it is not likely."[19]

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[16]Martin Heidegger, An Introduction to Metaphysics, trans. Ralph Manheim (Garden City, New York: Doubleday, 1961), p. 74.

[17]See paragraph 293, Section I, of Wittgenstein's Investigations for his attack on private meaning.

[18]Ludwig Wittgenstein, Tractatus Logico-Philosophicus, trans. D. F. Pears, B. F. McGuinness (London: Routledge and Kegan Paul; New York: The Humanities Press, 1963), p. 3.

[19]Wittgenstein, Investigations, p. Xe.

When again Wittgenstein comes to say that words derive their meaning from (1) their use, and (2) their context, we are led to think of Kierkegaard and his use of words to lead one into the condition (context) where he may receive the truth. For Wittgenstein, the meanings of concepts are almost inextricably tied up with the meanings of related concepts. If we start to explain the meaning of some concept, say a philosophical one, we find ourselves explaining the meaning in terms of other philosophical concepts.

I mention Heidegger and Wittgenstein merely to call attention to the fact that the kind of uncertainty so intimately felt and so arduously avoided by Kierkegaard is still very much with us. Indeed, since the time Descartes formulated what Whitehead called the "subjectivist principle" and made "clear and distinct conception" the mark of truth, scepticism about the knowing process, which, from the standpoint of cybernetics, is the other side of the communication process, has haunted modern philosophy.

If one makes the starting point of philosophy that which is clearly and distinctly present to a subject, I do not see how Hume's sceptical conclusions and the uncertainty engendered by those conclusions can be avoided. After all, that which is clear and distinct is just that--clear and distinct--and there is no necessary connection between things distinctly conceived on the same level of analysis.

One can, with the later Wittgenstein, settle for clarity and not attempt to achieve complete distinctness, or one can attempt to construct a model which allows for distinctness at a given level, to any desired degree, without imagining that complete distinctness is possible, or even that the notion of complete distinctness makes sense.

Hume believed that one distinct conception in no way entailed another distinct conception; but are the distinct conceptions of one man identical with those of another? (A part of the meaning of the word "intelligence" is the degree to which a given individual can isolate and distinguish.)

For some people, the concept of Christian actually entails the concept of belief in a literal interpretation of the Bible. By this I mean that if some individual does not believe in a literal interpretation of the Bible then it is impossible for these people to conceive of him as a Christian. I am well aware that what I am saying here implies a linking of logic with psychology. One can also use the word logic in connection with an agreed-upon set of rules applied to terms where various relations of entailment are agreed to hold.

Two levels of "agreement" need to be distinguished here. First, we have definitions which are arrived at through dialogue. Second, there is a presumption that agreement must have already been reached with respect to

certain basic terms; otherwise, we would not be able to make a beginning at all. At the first level, we are directly aware of agreement; at the second, agreement is a necessary hypothesis.

Plato, in the Meno, advises us to proceed upon hypothesis when no teacher is available, and cybernetics allows us to elaborate a model of man in which we can explain our certainty about being uncertain. (I have already dealt with certainty in Chapter Three.) I have, I think, made adequate preparation for the following statement: It is simply a fact of human experience that what we know is distinct; this is a fundamental, inexplicable[20] fact. It is also a fundamental fact that we can blur distinctions and, for example, see cows, hogs, and chickens as sources of protein. Cybernetics allows us to reconcile these two fundamental facts. Everything depends on the level of coding, or homomorphic reduction.

It is necessary that I interrupt the main thread of my essay here to assert that I am aware of a difficulty which arises in conjunction with an explanation of the given. Descartes would have us analyze that which is perceptually given into that which is conceptually simple or

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[20]By this, I mean that the explanation will be less certain than the fact.

self-evident.[21] But no conceptual analysis of the table on which I am writing into a collection of points and lines and relations between points and lines has the immediacy of the table as I experience it. Hume, in order to explain how it is that we have a conception of space,[22] would analyze the table into a collection of points, but I do not experience a collection of points.

The difficulty with both Descartes and Hume is that their "bloodless dissection," carried out for the purpose of giving an explanation of the perceptually given, does not square with the immediacy of the perceived given.

Yet, in so far as the table can be known, we must know it as a line of behavior. Speaking almost in metaphor, we say that my experiencing the table is a process whereby the subjective becomes objectified, a process whereby what is datum for thought or feeling is, through the process of homomorphic reduction, rendered as thought or feeling.

If, for purposes of explanation and in accordance with our feeling, we maintain that the data of thought or feeling arise from an external world (we are now hopelessly trapped in metaphysics), we will probably say that my monitoring of the table, at least the feeling component, is a

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[21] See Descartes' "Rules for the Direction of the Mind," Descartes Selections, ed. Ralph M. Eaton (New York: Charles Scribner's Sons, 1955), in particular, p. 80.

[22] David Hume, A Treatise of Human Nature, Hume Selections, ed. Charles W. Hendel, Jr. (New York: Charles Scribner's Sons, 1955), p. 16.

process whereby the objective is rendered subjective. The whole activity, from beginning to end, may be characterized as the process whereby the objective world is "objectified" in thought.

A metaphysical defense of the general theory of systems thus rests upon a claim: Thought is about discrete objects; our language, if nothing else, guarantees this. Any explanation of a reality below the level of thought must, when talked about, acquire, if it does not "naturally" possess, a discrete character. ("I gotta use words when I talk to you.") So, when I say atomic actuality governs perception, I simply mean that any description, or discussion, of any hypothetical mechanism of perception will impart, because of our language and the very nature of information transfer, the notion of atomicity.

Furthermore, at the level of direct awareness, it is, I maintain, impossible even to imagine an ordering process which does not imply discreteness. In fact, the notion of ordering the non-discrete is very close to, if not actually, being analytically impossible (or self-stultifying).

It is also a fact that we approach our fellow men, and indeed, anything else, as though he were a determinate machine, as though one state of the system entailed another state of the system. In every case, we "abstract(?)" a determinate model. It is my contention that this assertion

needs no proof. All anyone need do to be convinced is consult his own experience. These principles, that of "atomic actuality," which governs perception, and "conceptual entailment," which governs explanation, are inescapable if one wants to indulge in metaphysics. Why, then, not be honest with ourselves and accept the metaphysical implications of these principles?

The model which we perforce use, or, at any rate, the model we must appeal to when we give explanations, that of the discrete-state, finite, determined machine, simply does not allow the possibility of there being an answer to many of the problems of philosophy.[23] It is impossible, in principle, to give an adequate answer to the question: "What is the nature of the whole universe?" For our ability to say anything at all necessitates that we choose among possibilities; and if we said what the universe is like, that answer would have to include all possibilities. It is impossible, in principle, to give an explanation of our atomic apprehension of the world. Anything in terms of which an explanation could be given of that which is presented in experience as discrete, would itself of necessity have been given as discrete; this demand is built into our model. Finally, it is impossible for a machine to monitor

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[23]This statement must not be taken as implying that the notion of continuity is excluded from explanation. A little reflection will convince anyone that both discreteness and continuity are involved in explanations.

completely, or take complete account of, itself--this point was developed earlier.

I have gone to some lengths to develop the notion of indirect communication because it is both essential for an explanation of human affairs and, I think, tacitly taken for granted in our day-to-day actions. The final chapter continues the discussion of communication.

CHAPTER VI

A *FOCUS IMAGINARIUS*: THE LIBERALLY EDUCATED MAN

> [Transcendental ideas or dialectical concepts] . . . have an excellent, and indeed indispensably necessary, regulative employment, namely, that of directing the understanding towards a certain goal upon which the routes marked out by all its rules converge, as upon their point of intersection. This point is indeed a mere idea, a *focus imaginarius*, from which . . . the concepts of the understanding do not in reality proceed; none the less it serves to give these concepts the greatest (possible) unity combined with the greatest (possible) extension.
>
> Immanuel Kant

Although Shannon's work in information theory is one of the most vital facets of the general theory of systems, that work of itself does not solve the linguistic problems surrounding the act of communication. On the other hand, prior to Shannon's work, every attempt to deal with the problem of interpersonal communication ultimately involved one in some kind of paradox due to some seemingly unavoidable category mistake made at some point in the investigation. Furthermore, until the advent of cybernetics, it was impossible to formulate in terms of a model two obvious and

important aspects of communication: communication on the nonverbal level and indirect communication. I hope now to show how it is that our present frame of reference, characterized by categorical habits of thought, can be shown to be inadequate, and through this showing to make you see a way out of the bottle. In order to effect this indirect communication, I will present directly my image of the ideal man, the liberally educated man, and discuss some of the problems attending his development. It will perhaps help to think of this effort as an attempt to doubly define the liberally educated man.

It is impossible to define satisfactorily the liberally educated man from a categorical perspective. That is, as long as one thinks of words as names of classes and names of relations between classes, he will not see the world in such a way as to be able to generate any definition he can remain happy with. This is so whether the attempt is lexical, genetic, behavioral, or even, as I will show later, ostensive.

Nevertheless, it is useful to make attempts at definition. Such attempts can lead us to a more adequate conception of language; we say what we can and so find out what cannot be said.[1] It is particularly useful to attempt a definition of the liberally educated man because the attempt

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[1]This notion can be found in Kierkegaard, Wittgenstein, and Dewey.

to define this kind of man from a categorical perspective may lead one into just that perspective, or frame of reference, where and from which a useful definition can be offered and understood.

The use of statements formed in, and from, the categorical perspective may lead one to see that these statements are, from an entirely different point of view, nonsense. In order to understand the term "liberally educated man," you must become just that, and that is why the definition of the liberally educated man should be attempted. This is not to say that everyone who attempts to define this term will be led to see the world in a different way; but it will tend to be so, and perhaps in a few the transformation will be complete.

Many attempts at defining the liberally educated man have been made from the categorical perspective. I shall not dwell upon them but instead will characterize them as one of the following types:

I. Lexical attempts: Here one says, "Look at the meaning of each significant term in the phrase" (the article is here unimportant, since "the" could be "a" without altering our problem). Now, you put together the meanings of "liberal," "educated," and "man," and there you have it--the definition of "liberally educated man."

II. Genetic attempts: Here one attempts to understand the meaning of the phrase by examining environmental

aspects which might produce one of these creatures we call a liberally educated man. Here we might say, "I may be unable to tell you what a liberally educated man is, but I can tell you how to produce one."

III. Behavioral attempts: Here we tell some of the things a liberally educated man does and does not do. There are two aspects to this approach. One can talk in general terms: The liberally educated man is honest, trustworthy, reverent, etc. Alternatively, one can try to specify the liberally educated man's behavior in unique situations. The more detail that is given, the more this latter approach resembles our next attempt.

IV. Ostensive or quasi-ostensive attempts: Here one takes specific examples of liberally educated men--either historical or fictional figures--and says, "By liberally educated man I mean someone like Gandhi, Buddha, Jesus, etc."

The lexical attempt leads one to play the most peculiar of language games--the one in which one tries to find criteria for good definitions. At back of this activity there has often been the notion that words have, or ought to have, essential, exact, or precisely limited meanings. In addition, it is often felt that one ought to be able to specify in advance all possible meanings and the exact

limits of these meanings before he is entitled to use a word[2] (before you can say you are doing a pious act, you must specify what piety is).

But let us ask some simple questions. How is it that you already use words when you begin to play the language games of "definitions" and "giving rules for definitions?" And, what about those words you use to give your definitions --have you already defined them; do they have any exact boundary?

Perhaps you would like to say, "Our definitions are not complete." That is, if someone asks, "What do you mean by the term 'Oswald'?" you feel that you can respond with some list of definite descriptions.[3] That is, you say, "By Oswald, I mean the man who shot Kennedy, and the man who purchased such and such rifle from such and such mail order house, and the man who was shot by Jack Ruby." But now you go on to say, "Of course, I cannot exhaust the subject 'Oswald' by any list of definite descriptions," and here it looks as if our attempt to define has been somehow defeated by the complexity, the richness, of the subject.

At this point, one might say, "Yes, it is all very true that no list of descriptions will exhaustively define

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[2]See Gottlob Frege, "On Sense and Nominatum," Meaning and Knowledge, ed. Ernest Nagel, Richard B. Brandt (New York, Chicago, Burlingame: Harcourt, Brace and World, 1965), p. 77.

[3]See Bertrand Russell's theory of descriptions in "On Denoting," Meaning and Knowledge, pp. 78-87.

an object of sense experience." But even though something is always left out, the mesh of our conceptual net may be made as fine as we wish, and we can, so to speak, "know" the meaning of a sign to whatever degree of accuracy one may specify.[4] Alternatively, one might say, "All I mean by the term 'Oswald' is just the object of which this enumerated list of descriptions is true."

But what if in the above account of what I mean by "Oswald" it should turn out that one of the descriptions should be false? Suppose, for instance, it should be discovered that Oswald did not shoot the President. Am I now going to say I did not know what I was talking about when I used the term "Oswald"? But then, if I don't know, according to the picture developed here, how can I mean? And saying I intended such and such only obscures the issue, for how do I know what I intend?

It is easy to see that both the genetic and the general behavioral approach to defining the liberally educated man are subject to the same kind of criticism as the lexical, for the terms used in these definitions require definition if one is to feel absolutely certain that he knows what he is talking about.

The above consideration leads us to examine the ostensive definition. Faith in the ultimate veridical

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[4]See Friedrich Waismann on the open texture of empirical concepts in "Verifiability," Meaning and Knowledge, pp. 38-46.

character of ostensive definitions rests upon the belief that knowledge grows out of experience with particular instances. The final appeal here is to the particular case. William James makes this point well:

> If we should inquire for the essence of "government," for example, one man might tell us it was authority, another submission, another police, another an army, another an assembly, another a system of laws; yet all the while it would be true that no concrete government can exist without all these things, one of which is more important at one moment and others at another. The man who knows governments most completely is he who troubles himself least about a definition which shall give their essence. Enjoying an intimate acquaintance with all their particularities in turn, he would naturally regard an abstract conception in which these were unified as a thing more misleading than enlightening.[5]

But James' position, while undoubtedly having a strong intuitive appeal, is open to a grave criticism: it is always possible to misinterpret an ostensive definition. This can be easily seen in the following passage from Alice's Adventures in Wonderland. During the cross-examination of the Mad Hatter, the following scene occurs:

> Here one of the guinea-pigs cheered, and was immediately suppressed by the officers of the court. (As that is rather a hard word, I will just explain to you how it was done. They had a large canvas bag, which tied up at the mouth with strings: into this they slipped the guinea-pig, head first, and then sat upon it.)
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> "I'm glad I've seen that done," thought Alice. "I've so often read in the newspapers, at the end of trials, 'There was some attempt at applause, which

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[5]William James, The Varieties of Religious Experience (New York: Modern Library, 1902), pp. 27-28.

> was immediately suppressed by the officers of the court,' and I never understood what it meant till now."[6]

Now Alice knows the meaning of the term "suppress," and one can imagine her envisioning an "attempt at applause" or the people making the attempt being stuffed in a sack and sat upon. But, our example need not be so complicated; one can imagine the pointing gesture being misinterpreted. Thus, avoiding abstractions, as James advises, will not answer the criticism.

But if, as now seems the case, all attempts at definition, and especially all attempts at defining abstract terms, are foredoomed to failure, what is the use of making such an attempt? The Socratic dialogues were just such attempts. Nevertheless, some light can be shed on this question by considering them. The whole procedure of definition of abstract terms seems to be illegitimate or senseless, but then why do the dialogues produce in us the feeling that we know more than when we began? The value of the dialogues is that they lead us to explore the terrain of language; we acquire a better acquaintance with the use of terms by operating with them. Also, wrestling with terms alters our perspective. Not only do we learn the uses of language, but we become somewhat aware of its limitations.

Considering the general term "liberally educated man," which we have chosen as the focus of this chapter,

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[6]The Complete Works of Lewis Carroll (New York: Modern Library), p. 120.

produces a rather curious effect. Considering it tends to make one a suitable candidate for the label he is considering. And when one has struggled with this term until he sees that traditional attempts to justify its employment are nonsense, he will, of course, no longer need such justifications. The propositions employing the term "liberally educated man" serve as steps to climb beyond them. Ludwig Wittgenstein suggests that we must throw away the ladder after we have climbed up. I do not see the necessity for this; after all, someone else may need it.[7]

Now I am prepared to offer a definition of the liberally educated man! He is the man who has seen through language, and, of course, this definition will be nonsense to anyone who has not done just that.

Now let me set forth a model in terms of which we may talk about the problems of imparting a liberal education, a model that will enable us to talk meaningfully about the problem of producing liberally educated men. If I were to say at this point, "Let us regard man as a very complex servo-mechanism," this could be a mistake. When I am attempting to communicate with another person, I will characterize this situation as the interaction of coupled systems with the language serving as the communications channel. The parts of the language, however we choose to code them, may be characterized as operators. That is, they

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[7]See Wittgenstein, Tractatus, para. 6.54.

function in an elicitative capacity. Therefore, if I use a sentence like "man is a servo-mechanism," I would not be likely to get a desired response.

Traditionally, communication has been characterized far too simply. The usual account is that information is passed from one person to another much as one might write down a copy of one letter from another; and, of course, many people have known that there was something wrong with this picture, but what they have said offered no solution to the difficulties they envisaged. It is customary to say something like "no utterance ever means the same thing to two people because of their differences in experience, heredity, age, social background, etc." This sort of account will lead one to be pessimistic about communication.

Contrast this picture to that of interacting systems. Here we are not thinking in terms of duplication from an original; rather, our picture is that of one system gradually bringing another into phase with itself. The important thing is how the words operate to accomplish this feat, and this is why a statement like "man is a servo-mechanism" will not do. Such a statement, although approximately right from a categorical stand, is self-defeating as a means of establishing our desired set in someone with a literary background. It would be like pulling the watch dog's chain when we want him to remain sleeping in his dog house.

The notion of interacting systems can be used to make intelligible the features of our culture. I can, for instance, characterize the university and the larger community as interacting systems and discuss the problems of education with respect to this coupled system and the information channels that accomplish the coupling. When this view is taken, it is easy to characterize the university community as a system with a measure of control over its input to the extent that some degree of stability obtains.

Part of this control over input shows up in the selection of new teachers: those selected to teach have good academic records, which simply means they have attuned themselves to the "system."[8] They orient themselves towards satisfying the criteria of academic success (getting grades), and, unfortunately, the permissible internal variety in such subsystems (academic people) rapidly, with each new generation, becomes smaller and smaller. The total picture, then, of higher education is nicely described as an oscillating system with negative feedback tending toward stability wherein the permissible internal variety of sub-units is practically nil. In others words, the system of higher education, once established, tends rapidly toward an extremely narrow, completely artificial, and absolutely dead

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[8]This attuning of oneself to others and his surroundings is touched on by Hume and is strongly suggested in the Romantic poets of England and America. All this was discussed in Chapter Five.

conformity.[9] The only thing that saves the situation is the input from the larger culture.

But as elementary and secondary education come more and more into the hands of people who have graduate degrees, the shaping and filtering process is extended more and more to lower levels. And as this happens, more and more the students will be cast into the mold of their teachers. So the input from the larger culture will be in large measure stabilized.

And now one may legitimately ask, "What is the point of all this?" Well, I have suggested that we think of a man as a system, that we think of communication as the interaction of coupled systems, and that we may regard the larger culture and the institution of higher learning as coupled or interacting systems. I have further said that the education system can be well characterized as a self-stabilizing machine with much control over its input and that this control is growing. It follows from this, to the extent my description is accurate, that higher education is a danger to the wider culture.[10]

It can be further seen, and not by any means incidentally, that such a system cannot produce the liberally educated man. To make this point more explicit, let me now,

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[9]It would take a paper the size of the present manuscript to present the evidence for this point alone.

[10]This is the point of Harold Benjamin's The Saber-Tooth Curriculum.

in terms of the notions we have just been discussing, offer another definition of the liberally educated man. He is the man who thinks in terms of systems--not in terms of parts. Furthermore, he is open to information channels of a much finer mesh than most men. For purposes of illustration, I will confine this to the verbal level. When the umpire in a ball game says to a player, "You're out!" it would be ludicrous to treat this statement as though it might be a proposition--might be true or false. His act of saying "You're out!" is a performative utterance--it is what makes the player "out."[11] The performative and the constantive are only two dimensions of an utterance's capacity to serve as an operator. There are many levels and shades of meaning to our expressions, and these expressions, loaded as they are with information, mean much more to the man who can take some account of the nuances of meaning contributed to our expressions by the surroundings. Such a person is the liberally educated man.

The above definition of the liberally educated man--that he thinks in terms of systems--must be amended. The liberally educated man also sees just what systems are relevant to a given problem. He has the ability to code

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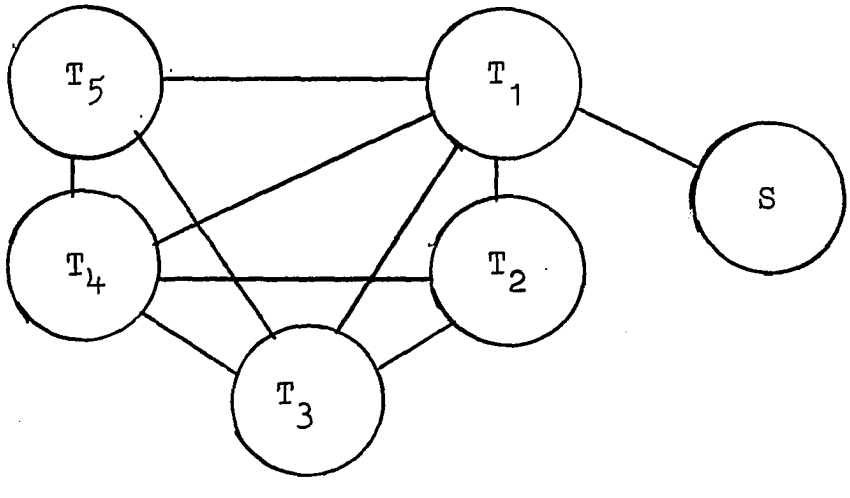
[11] See J. L. Austin, How to Do Things with Words, ed. J. O. Urmson (New York: Oxford University Press, 1965), Lectures I and II. Actually, my example is a little simplistic. While the performative element is strong here, there are conditions under which one can persuade the umpire to change his call.

properly the elements of a problem into an adequate system--to see the relatedness of things with reference to using these relations to alter a preceding state of affairs, with suitable input, or to at least predict a subsequent state from a given state. In these matters the liberally educated man will take account of the monitor and control system's limitations--he will appreciate his own limitations.

The important thing is to know what game you are playing. If, for instance, a book seller wants to sell books to teachers, he can rely upon statistical data for his canned sales pitch because the individual teachers as a class do not interact to any appreciable extent. If, however, a book salesman goes to any particular institution, he had better take into account the loose interaction among the teachers in that school. And if he really wants to sell books, he had best focus down on the much more tightly knit systems--the individual teachers. The situation may be schematized thus:



For a given teacher, there will be, of course, inputs and outputs to people other than teachers--his immediate family, for instance. In practice, these linkages must also be taken into consideration. If our salesman approaches each teacher as though he or she were just that--his restricted stereotype of a teacher--he may succeed in taking some orders, but he will not be a <u>salesman</u>. He must, if he is to succeed, approach each man as an individual, rapidly adjusting his input to a given system (man) in response to the output. Of course, the situation is tricky. Systems as complex as men have a good deal of control over the input to the system--that is, they can rapidly stabilize many forms of input so as to preserve a steady state in the system. It is not easy to manipulate others. No system can organize another unless it (1) "correctly" models the system to be controlled and (2) possesses greater variety, is able to map the controlled system's linkage to other systems. In plain language, if X is to control Y, X must be better informed and more intelligent than Y. The extraordinary salesman must be an extraordinary man! He must discover ways of upsetting, to some extent, the stability of those systems he interacts with. Also, he must take account of the loosely knit larger systems of which each teacher is a part. If he can, for instance, establish contact with teachers 1, 2, 3, and 4 then his ability to affect 5 will probably be greater. Rarely will the salesman need to consider any systems besides the individual teacher and the institution

of which he is a loosely linked member. But, of these two, concern with the individual teacher is more important, for here, in these direct personal encounters, information channels almost too numerous to count become available. If the salesman is capable, he will instantaneously adjust to the feedback from the teacher. This ability to handle social situations on what might be called the intuitive or unconscious level is a delicate thing, and it is a sad day in the life of the salesman when he smiles at the customers and they do not smile back.[12] Cybernetics can account for this, too.

But now, how does my second definition, framed from the standpoint of cybernetics and justified from that standpoint, agree with my other definition of the liberally educated man, given earlier in this chapter? Making these definitions fit will bring unity to this enterprise and, I hope, provide a basis from which to offer some suggestions for creating conditions favorable to the development of liberally educated men.

"That he thinks in terms of systems" is what I would say of the liberally educated man as an observer--from an objective standpoint. This is how he looks from the outside, in light of the frame of reference I choose to employ. "That he has seen through language" is a definition that, I think, can only be properly understood from the perspective of one who has done just that--seen <u>through</u> language. Note

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[12]After Arthur Miller's <u>Death of a Salesman</u>.

that my "objective" definition is just that--"my objective definition." It is a definition given from a point of view, and it is justified in terms of the language constructed from that perspective. My subjective definition has to do with one who has freed himself from the categorical perspective, together with seeing that this perspective must be abandoned. I can say this no better, and perhaps you will say this is nonsense, but what I see as important in language from a subjective standpoint is not what can be said but what shows itself in language as I operate with the language.

From my objective view of the liberally educated man, I would say that the subjective definition can be accounted for as describing a monitor capable of varying its information exchange (both input and output) and taking account of the fact that it can do just that. From the subjective standpoint, I would describe the objective definition as something like a variable lens, or possibly an interpretive schema for bringing about a new way of processing and interpreting information. They hang together in this peculiar way--each can explain the other. While of the two aspects the subjective is, perhaps, more philosophically important, the objective is a necessary complement. It allows one to go on and frame a general theory of action.

Other men have, so to speak, seen through language. I am confident that this was true of St. Paul, Kierkegaard, and Wittgenstein, but they had nowhere to go from there.

The conceptual schema of cybernetics had not been elaborated in their time, although Wittgenstein had some insights which might have led to a similar position. At any rate, most men have only had a categorical framework to fall back on; as Wittgenstein said, "A picture held us captive." Cybernetics is the necessary complement to the work of Wittgenstein.

One might object here, saying, "How is it, then, that your 'objective' definition could be applied descriptively to people who lived before the concepts of cybernetics were worked out?" The answer is, "That is how I interpret these men and describe their actions." I, conversant with this frame of reference, find there, within the concepts at home in that frame of reference, the most adequate way of giving an objective definition of the liberally educated man.

Let us retrogress and digress a bit and pick up our discussion of ostensive definitions. The quotation from Lewis Carroll shows in a striking way that ostensive definitions can always be misunderstood. Well then, why are they not always misunderstood, and why does this not make us feel that people always slightly misunderstand each other? But, first, let me say that in most instances of daily intercourse I do not doubt that communication has taken place. The fact that I might doubt, and do not, seems important. Why is this so? Is it perhaps a sign that I am not a philosopher? Can I explain this situation

from my cybernetic model of man and the world? One possible explanation would go like this: When two people converse, there are, in addition to the extremely crude information transfer through what might be called the cognitive meanings of words, many other cues and nuances of meaning picked up and processed below the conscious level. We might say that we only hear the dominant note in the chord with none of the other notes and none of the overtones; the conscious mind--the monitor--is tone-deaf. And, moreover, it seems to me that at those times when we feel most certain that we have communicated, we feel in <u>harmony</u> with one another. This can be interpreted as information concerning the reciprocal feedback adjustments of the two systems to each other. In our model, we would have second-order monitors which take account of these situations. The foregoing is just a hint of how a theory of meaning could be derived from cybernetics.

If one accepts my view of man, what follows for remolding education is obvious; so I will be brief. In the first place, we examine our educational system in its relation to our larger culture. Then we study these systems in interaction to see just what needs to be done in order that the subsystems, men, caught in these larger systems may be led to see through their culture--in its most basic form--its language. We will try to set up conditions that will favor this kind of development.

One obvious step in the right direction would be gradually (and it can only be done gradually) to break the vicious feedback in education whereby the system keeps control over its input. One of the necessary moves toward accomplishing this is by a direct attack on all tests and measurements. We must argue that the only instrument possessing sufficient variety to assess man is man and that this cannot be done on the conscious level alone. Strangely enough, the concepts of cybernetics could, in this way, be used to bring about just those adjustments in society that will produce men capable of utilizing these concepts.[13]

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[13]Evidence for the assertion that bureaucracies, once they are well established, need have little contact with the larger needs of the supporting culture can be found in C. Northcote Parkinson's Parkinson's Law (Boston: Houghton Mifflin, 1957), pp. 8-11.

SELECTED BIBLIOGRAPHY

Ammerman, Robert R., ed. Classics of Analytic Philosophy. New York: McGraw-Hill, 1965.

Anderson, Alan Ross, ed. Minds and Machines. Englewood Cliffs: Prentice-Hall, 1964.

Aristotle. The Basic Works of Aristotle, ed. Richard McKeon. New York: Random House, 1941.

_____. The Philosophy of Aristotle, trans. J. L. Creed, A. E. Wardman. New York, Toronto: New American Library; London: New English Library, 1963.

Ashby, W. Ross. Design for a Brain. London: Associated Book Publishers, 1960.

_____. "Design for an Intelligence-Amplifier," Automata Studies, ed. Claude E. Shannon, J. McCarthy. Annals of Mathematics Studies, No. 34. Princeton: Princeton University Press, 1956, pp. 215-51.

_____. An Introduction to Cybernetics. New York: John Wiley and Sons, 1966.

Auden, W. H. The Orators. New York, Random House, 1967.

Austin, J. L. How to Do Things with Words, ed. J. O. Urmson. New York: Oxford University Press, 1965.

Bakewell, Charles M. Source Book in Ancient Philosophy. Rev. Ed. New York: Charles Scribner's Sons, 1939.

Benjamin, Harold. The Saber-Tooth Curriculum. New York, London: McGraw-Hill, 1939.

Berger, Peter L. and Thomas Luckman. The Social Construction of Reality. Garden City, New York: Doubleday, 1967.

Buckley, Walter. Sociology and Modern Systems Theory. Englewood Cliffs: Prentice-Hall, 1967.

Cannon, Walter B. The Wisdom of the Body. New York: W. W. Norton, 1939.

Carroll, Lewis. The Complete Works of Lewis Carroll. New York: Modern Library.

Coleridge, Samuel Taylor. The Poems of Samuel Taylor Coleridge, ed. Ernest Hartley Coleridge. London: Oxford University Press, 1960.

Conrad, Joseph. Tales of Land and Sea. Garden City, New York: Doubleday, 1953.

Darwin, Charles. The Expression of the Emotions in Man and Animals. Chicago, London: University of Chicago Press, 1965.

Descartes, René. Descartes Selections, ed. Ralph M. Eaton. New York: Charles Scribner's Sons, 1955.

_____. "The Geometry," The World of Mathematics, ed. James R. Newman. Vol. I. New York: Simon and Schuster, 1956, pp. 239-53.

Dewey, John. On Experience, Nature, and Freedom, ed. Richard J. Bernstein. Indianapolis, New York: Bobbs-Merrill, 1960.

_____. Reconstruction in Philosophy. Enlarged Ed. Boston: Beacon Press, 1965.

Frege, Gottlob. "On Sense and Nominatum," Meaning and Knowledge, ed. Ernest Nagel, Rachard B. Brandt. New York, Chicago, Burlingame: Harcourt Brace and World, 1965, pp. 69-78.

Hebb, D. O. The Organization of Behavior. New York: John Wiley and Sons, 1949.

Hegel, Georg Wilhelm Friedrich. Encyclopedia of Philosophy, trans. Gustav Emil Mueller. New York: Philosophical Library, 1959.

Heidegger, Martin. Being and Time. Trans. John Macquarrie, Edward Robinson. New York, Evanston: Harper and Row, 1962.

_____. An Introduction to Metaphysics, trans. Ralph Manheim. Garden City, New York: Doubleday, 1961.

Hume, David. Hume Selections, ed. Charles W. Hendel, Jr. New York: Charles Scribner's Sons, 1955.

_____. A Treatise of Human Nature, ed. T. H. Green, T. H. Grose. 2 vols. London, New York: Longmans, Green, 1898.

Husserl, Edmund. Ideas, trans. W. R. Boyce Gibson. New York: Collier Books, 1962.

James, William. Essays in Pragmatism, ed. Alburey Castell. New York, London: Hafner Publishing Co., 1966.

_____. The Varieties of Religious Experience. New York: Modern Library, 1902.

Kant, Immanuel. Critique of Pure Reason, trans. Norman Kemp Smith. Unabridged Ed. New York: St. Martin's Press; Toronto: Macmillan, 1965.

Kierkegaard, Søren. Concluding Unscientific Postscript, trans. David Swenson, Walter Lowrie. Princeton: Princeton University Press, 1941.

_____. Either/Or, trans. David F. Swenson, Lillian Marvin Swenson, rev. Howard A. Johnson, Vol. I. Garden City, New York: Doubleday, 1959.

_____. Philosophical Fragments, trans. David F. Swenson, Niels Thulstrup, Howard V. Hong. Princeton: Princeton University Press, 1962.

Kleene, S. C. "Representation of Events in Nerve Nets and Finite Automata," Automata Studies, ed. Claude E. Shannon, J. McCarthy. Annals of Mathematics Studies, No. 34. Princeton: Princeton University Press, 1956, pp. 3-43.

Krutch, Joseph Wood. "Men, Apes and Termites," Saturday Review, XLVI (Sept. 21, 1963), pp. 22-25.

Lucas, J. R. "Minds, Machines and Gödel," Minds and Machines, ed. Alan Ross Anderson. Englewood Cliffs: Prentice-Hall, 1964, pp. 43-59.

McGreal, Ian Philip. Analyzing Philosophical Arguments. San Francisco: Chandler Publishing Co., 1967.

Malthus, Thomas Robert. "Mathematics of Population and Food," The World of Mathematics, ed. James R. Newman. Vol. II. New York: Simon and Schuster, 1956, pp. 1192-99.

Marquis, Don. The Lives and Times of Archy and Mehitabel. Garden City, New York: Doubleday, 1950.

Mason, Stephen F. A History of the Sciences. New Rev. Ed. New York: Collier Books, 1962.

Mead, George Herbert. Selected Writings, ed. Andrew J. Reck. Indianapolis, New York, Kansas City: Bobbs-Merrill, 1964.

Nagel, Ernest and James R. Newman. "Goedel's Proof," The World of Mathematics, ed. James R. Newman. Vol. III. New York: Simon and Schuster, 1956, pp. 1668-95.

Nietzsche, Friedrich. Beyond Good and Evil, trans. Marianna Cowan. Chicago: Henry Regnery Co., 1965.

Neumann, John von. "The General and Logical Theory of Automata," The World of Mathematics, ed. James R. Newman. Vol. IV. New York: Simon and Shuster, 1956, pp. 2070-98.

_____ and O. Morgenstern. Theory of Games and Economic Behavior. Princeton: Princeton University Press, 1947.

Parkinson, C. Northcote. Parkinson's Law, and Other Studies in Administration. Boston: Houghton Mifflin, 1957.

Peirce, Charles S. Values in a Universe of Chance, ed. Philip P. Wiener. New York: Doubleday, 1958.

Pierce, J. R. Symbols, Signals and Noise: The Nature and Process of Communication. New York, Evanston, London: Harper and Row, 1961.

Quine, Willard Van Orman. From a Logical Point of View. 2nd. Ed., Rev. New York: Harper and Row, 1963.

_____. Mathematical Logic. Rev. Ed. New York, Evanston: Harper and Row, 1962.

_____. Word and Object. Cambridge, Mass.: M.I.T. Press, 1965.

Russell, Bertrand. "On Denoting," Meaning and Knowledge, ed. Ernest Nagel, Richard B. Brandt. New York, Chicago, Burlingame: Harcourt, Brace and World, 1965, pp. 78-87.

Ryle, Gilbert. The Concept of Mind. New York: Barnes and Noble, 1965.

Santayana, George. Scepticism and Animal Faith. New York: Dover Publications, 1955.

Schutz, Alfred. The Phenomenology of the Social World, trans. George Walsh, Frederick Lehnert. Evanston: Northwestern University Press, 1967.

Shannon, Claude E. and Warren Weaver. The Mathematical Theory of Communication. Urbana: University of Illinois Press, 1949.

Shannon, Claude E. "A Universal Turing Machine with Two Internal States," Automata Studies, ed. Claude E. Shannon, J. McCarthy. Annals of Mathematics Studies, No. 34. Princeton: Princeton University Press, 1956, pp. 157-65.

Skinner, B. F. Verbal Behavior. New York: Appleton-Century Croft, 1957.

_____. Walden Two. New York: Macmillan, 1962.

Smith, Adam. The Theory of Moral Sentiments. 11th ed. 2 vols. Edinburgh: Printed for Bell and Bradfute, 1808.

Strawson, P. F. Introduction to Logical Theory. London: Methuen, 1967.

Turing, A. M. "Can a Machine Think?" The World of Mathematics, ed. James R. Newman. Vol. IV. New York: Simon and Schuster, 1956, pp. 2099-2123.

Vajda, S. "Theory of Games," The World of Mathematics, ed. James R. Newman. Vol. II. New York: Simon and Schuster, 1956, pp. 1285-93.

Waismann, Friedrich. "Verifiability," Meaning and Knowledge, ed. Ernest Nagel, Richard B. Brandt. New York, Chicago, Burlingame: Harcourt, Brace and World, 1965, pp. 38-46.

Wellek, René. "Romanticism Re-Examined," Romanticism Reconsidered, ed. Northrop Frye. New York, London: Columbia University Press, 1964, pp. 107-33.

Whitehead, Alfred North. Process and Reality, An Essay in Cosmology. New York: Harper and Brothers, 1960.

Whitehead, Alfred North. Science and the Modern World. New York: The New American Library, 1964.

Whorf, Benjamin Lee. Language, Thought and Reality, ed. John B. Carroll. Cambridge, Mass.: M.I.T. Press, 1956.

Wiener, Norbert. Cybernetics, or Control and Communication in the Animal and the Machine. 2nd ed. Cambridge, Mass.: M.I.T. Press, 1965.

Windelband, Wilhelm. A History of Philosophy. Vol. I. New York, Evanston: Harper and Row, 1958.

Wittgenstein, Ludwig. Philosophical Investigations, trans. G. E. M. Anscombe. New York: Macmillan, 1965.

_____. Remarks on the Foundations of Mathematics, ed. G. H. von Wright, R. Rhees, G. E. M. Anscombe; trans. G. E. M. Anscombe. Cambridge, Mass., London: M.I.T. Press, 1967.

_____. Tractatus Logico-Philosophicus, trans. D. F. Pears, B. F. McGuinness. London: Routledge and Kegan Paul; New York: The Humanities Press, 1963.

_____. Zettel, ed. G. E. M. Anscombe, G. H. von Wright; trans. G. E. M. Anscombe. Berkeley, Los Angeles: University of California Press, 1967.

Wordsworth, William. Poetical Works of Wordsworth, ed. Thomas Hutchinson, rev. Ernest de Selincourt. London, New York, Toronto: Oxford University Press, 1961.