THE PARADIGMS OF PSYCHOLOGY AND SYSTEM DYNAMICS*

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ABSTRACT

This paper compares and contrasts the philosophical and methodological paradigms used by psychologists and system dynamicists. Currently, psychologists collect huge amounts of data, use open loop methods of experimental design, and think that classical statistical models, such as the analysis of variance and regression analysis, provide the most useful methods for studying social phenomina. Behavioral approaches to psychology differ sharply with the system dynamicists concerning the relative importance of external vs. internal sources of influence on behavior. The behaviorists focus on controlling the external environment, even denying the existance or importance of internal states. The problems of using external control are illustrate by contrasting two simple attitude change models; one which modifies attitudes solely through outside influences and another which makes the change in attitudes a function of the state variables. System dynamicists attempt to understand the dynamics of social processes through the study and analysis of dynamic loop structure. These techniques would be extremely useful for those psychologists using correlational analysis and causal modeling methods, where the implications of dynamic structure are not always fully understood.

The purpose of this paper is two-fold. The first goal is to explore areas where the system dynamicist and psychologist can contribute to each other's knowledge of social systems. The second goal is to suggest points where the science of psychology can make strides toward building a more comprehensive theoretical foundation by adopting paradigms patterned after those used by system dynamicists.

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Those familiar with System Dynamics know that there is a distinct set of philosopical assumptions which place it apart from many other approaches to understanding social, biological and phyisical processes. It provides a means of viewing social systems in a rich manner, using the modern systems approach to complex problems. Indeed, it is these fundemental philosophical differences which has already had some profound influences on social thought. In particular, system dynamic thinking is diametrically opposed to much if not all of the philosophical assumptions held dear to most social scientists. Frankly, system dynamics appears to fly in the face of what might be considered "good" social science.

CHARACTERISICS OF PSYCHOLGICAL INQUIRY

It is difficult to characterize what psychologists do. A beginning text in the field presents what might be a mixture of very interesting, but unrelated topics, such as visual perception, learning in rats, development of motor coordination, coping, fantasy, learned helplessness, etc. [1]. Indeed, the field is too complex to address the problem of integrating this area in this short paper. However, there are major methodological and philosophical characteristics which transend many of the minor differences among existing schools. Moreover, with the exception of the psychoanalytic school, almost every group of psychologists within the mainstream of academic psychology are patently behavioristic, particularly among applied psychologists. This central focus on behavior, rather than dynamic structure immediately sets it apart from System Dynamics.

Table 1 indicates some of the major dimensions which characterize modern psychology. First, psychologists stress the study of information systems, caring less about flow and energy processes, in counterdistinction to, let us say, economics. Cognitive psychology, in particular, studies perception, learning and memory, and decision or judgmental processes. Research takes the cognitive psycholgist into the some exciting realms: language, brain processes, and computer technology.

To the system dynamicist, the psychologist's preoccupation with information handling should ring a sympathetic note, for indeed, following information around the loop structure is a major task of the model builder. The psychologist, in turn, can appreciate the inclusion of perceptual and informational delays which are stressed in system dynamic models. In fact, Forrester's discussion of how the exponential delay functions as a information and decision process concurs with what psychologists know about how people integrate information [2]. This is an insightful contribution to the study of decision processes, one which makes models very realistic from the psychological standpoint.

Cognitive psychology is making strides toward understanding memory, decision processes, perception and learning. However, although this area has been fruitful, nevertheless progress has been limited somewhat in at least three ways. First cybernetics

Table 1

A Comparison of Psychological and System Dynamic Methods

Psychology	System Dynamics
1. Empirical Orientation	1. Model Orientation
2. Use of Computers for Data Analysis	2. Use of Computers for Simulation
3. Skinnarians- Stress Control Through Changes In Outside Environment	3. Stress Control Through Changes in Internal Structure
4. Experimentalists- Use Open Loop Thinking	4. System Dynamicists- Use Closed Loop Thinking
5. Experimentalists- Study Interactions with Analysis of Variance	5. Study Interactions Through Analysis of Feedback Loops
6. Correlationists- Stress Measurement and Reliability Through First Order Correlations & Multivariate Analysis	6. Stress Dynamic Process Modeling & Qualitative Fit of Models to Data
7. Take an Empirical Approach Time Series Analysis	7. Stress Dynamic Loop Structure Underlying Time Series
8. Make No Hypothesis Concerning the Direction Of Loops in Causal Models Before Statistical Estimation Of Parameters	8. Hypothesize Direction And Purpose of Loops in Simulation Models

and feedback concepts are not well known to most cognitive psychologists. Secondly, psychologists define a decision much more narrowly than is necessary. Borrowing the perspectives of statistical decision theory and economic choice theory, psycholgists are interested in short-term, discrete situational choices which may or may not lead to dynamic consequences [3]. This approach follows from much of modern economic decision making models, which deal with extremely static situations, without regard to dynamic effects [4]. Finally cognitive psychology is limited by their reliance on the classical experimental paradigm and their insistence on statistical analysis of their data, a topic which will be discussed shortly.

It is interesting to contrast this approach with that used in system dynamics. The decision is a key concept in system dynamics. However, decision making takes on a much a much broader context. Decisions deal with continous processes which affect rates of flow into and out of storages. Although it is possible to consider individual decisions, system dynamicists focus on long-term effects of policies at decision points, which are represented by rate equations [5].

At the moment, academic psychology appears to be roughly divided into two general approaches, namely the experimental and correlational approach. This is only a convenient simplificaton, and indeed there are exceptions to this generalization. The central methodolgical theme cutting across both approaches is the stress on empiricism. At the end of the 20th century, psychology

has few general theories to fall back upon, yet has a rich accumulation of empirical literature that has been growing rapidly throughout the last 100 years.

EXPERIMENTAL PSYCHOLOGY

As the name implies, experimental psychology deals with the study of responses to manipulating one or more independent variables. Two school have emerged in recent years. The smallest in number are the operant conditioners, who use a set of methods pioneered by B.F. Skinner [6,7]. In applied areas, these Skinnarian techniques have been extended to cover many practical situations. Today behavioral modification is somewhat popular as a tool in mental health, education, and in industrial settings [8].

The idea behind behavioral modification is that, by using modern reinforcement techniques, one can control and change behavior. This is certainly not new or different. However it is the site of change which does differ from the central assumptions of the system dynamicist. To a behavioral modifier, the site of change comes from the outside, not from a change in inner structure. As a matter of fact, the idea of inner state variables appears to be avoided entirely. The individual frequently is considered as an unknown black box, potentially controllable from the outside environment. A skillful behaviorist can rid the individual of bad habits through the control of the immediate environment, through reinforcement techniques, etc., not by changing the dynamics of what is inside the black box.

It is ironical that the extreme behaviorist pays so much attention to the individual, yet completely ignores internal structure, which may determine much of the behavior that is the central content of the science of psychology. In contrast, the system dynamicist focusses upon internal structure. According to this group, most of the problems arise when the structure cannot cope with stress from the outside. One of the major activities of S/D is to discover the dynamic structure, locate points where problems arise, and to suggest changes in structure which may buffer the system from external control.

The two perspectives are indeed 180 degrees out of phase. Historically, Skinner has brought into experimental psychology the notion of control, and the ability to change individuals. It certainly is very close to being an empirically oriented control theory. There are three major requirements for controlling behavior. First one must have complete control of the environment. Second, one must know the past history of reinforcement schedules, and finally, third, control of behavior can be a function of the genetic makeup of the individual.

These three assumptions concerning the conditions for controlling behavior have become the basis for a new technology. Let us examine them in light of the perspective of system dynamics. First, in terms of controlling the environment, in many respects the purpose of system dynamics is to buffer oneself from

a hostile environment, so that the site of change, as we have noted is internal, i.e., within the boundary of the individual. Behavioral modification has been successful, but what are the costs of controlling the environment? The general question remains whether it is more efficient to control from the outside or make changes from inside the system boundary. This point will be brought out a later discussion of attitude change.

The second assumption deals with a knowledge of past reinforcement histories of the individual. From a systems point of view, knowledge of the past history really is a substitute for knowledge of the state of the system. The modern notion of state plays an extremely important role in system dynamics modeling [9]. Skinner refuses to recognize the usefullness of internal state concepts, yet in actually, if one individual acts differently from another because it has had a different history of reinforcement, then each is in a different state. State representation is not the only way to describe system behavior. The problem with Skinner's requirement of knowing the past history of the individual is primarily practical, for knowing every moment of the individual's past history of reinforcement is totally impossible. Moreover, in a deterministic system, two different past histories can lead to the same values of the state variables. Once this happens, the two trajectories will be identical from that point on. Spending time seeking a knowledge of past histories is wasteful of time and effort in some cases.

The third requirement for controlling behavior deals with the individual's genetic nature. Historically genetic components appeared late in the evolution of behavioristic thinking. Origin-ally, the founder of behaviorism, John B. Watson, felt that one can train any animal to do almost anything [10]. Indeed Skinner's original worked stressed this point. For example, one could see films of pigeons learning to play ping pong. Later people began to question these assumptions by indicating situations where genetic capacities introduced constraints on the learning process [11]. Indeed today there is a growing active - field of investigation looking for limitations to learning [12].

The third condition appears to be a modification of the classical environmental assumption of behaviorism. This, however, indicates that another type of dynamic internal structure, namely enzyme pathways, helps to determine behavior. Thus, in reality, in two out of three proposed major factors which determine behavior, modern behaviorists are not far from a state variable position. In terms of the site of changing behavior, however, system dynamics and behaviorism totally conflict.

DYNAMIC VS. STATIC ANALYSIS OF A PROBLEM. Not every psychologist subscribes to all of the practices of the Skinarians. For example Skinner concluded, after finding that the mean learning curve of a group of rats did not resemble individual learning curves, that the science of psychology should drop all statistical analysis and just follow individual cases over time. This issue separates the Skinnarians from other experimental psychologists.

In general, most researchers think that statistical analysis and design is the major framework with which to develop a science. Graduate students spend their first year learning the intricacies of repeated measures designs, Latin squares, orthogonal polynomials, and eta squares. A good graduate program in psychology brings the student far along the road of statistical sophistication. It is the hallmark of a department if their students know the latest form of the analysis of variance or perhaps are acquainted with a new time series model.

The major problem with emphasis on statistical analysis of data is that the statistical model underlying the analysis becomes a substitute for a process model, rather than being a device for organizing the data, exploring response surfaces, and suggesting functional relations among variables when nothing is known about the phenominon. Analysis of variance and regression models are very poor representations of social processes. In particular, dynamics are not well handled using analysis of variance, even when time becomes an explicit variable.

Another problem the statistical techniques used by experimental psychologists is that in some sense, methods like the complex analysis of variance become almost uninterpretable in situations where the experiment is a function of many independent variables. It is almost impossible to interpret seventh order interactions, yet we know that behavior is a function of many variables. System dynamics models attempt to capture the nature of the system. The interactions among variables are carefully studied as the structure of the model is developed. There is little problem in interpreting models which handle many variables, and indeed system dynamic models, such as the M.I.T. National Model, may involve hundreds of interacting variables [13]. The analysis of variance can only handle a restrictive number of variables before becoming totally useless to the researcher.

What are some of the problems with not perceiving differences between dynamic and static designs, situations, and processes? Although there might be many exceptions, especially among learning theorists, in general the differences between dynamic and static proceses are not always clearly distinguished in psychological studies. Take for example, the classical dosage response curve. One might want to vary the concentration of sugar as a reinforcement to see the effects on learning performance. In the independent groups design, each rat is assigned to one and only one concentration group, while in the repeated measures design, each rat would get all concentrations in perhaps random order [14]. The data from both types of studies would be presented the same way, namely mean performance as a function of increasing concentration of sugar. Indeed, a person reading a report of the study could not tell which design was used without reading the methods section.

A fundemental difficulty arises when carryover effects, such as learning, adaptation, etc. occur, which would violate the

standard analysis of variance models used to analyze the data. Now if there were carryover effects, then the results of a study using independent groups design would differ from those generated from a repeated measures design. Carryover effects, which are quite common, imply the influence of other state variables which are not picked up by measuring a single dependent variable. The number of levels or state variables is greater than one. The carryover effects themselves may be part of the true dynamics. In one case, the analysis of variance model could be extended to at least pick up the presence of carry over effects. In the independent groups design, carry over effects would be completely missed.

OPEN SYSTEMS THINKING. There are reasons for the popularity of statistics in psychology. Historically, the paradigm of the experimental method and statistical analysis came from work in agricultural and biological research. In these areas of experimentation, one literally goes to an experimental field, applies varying concentrations of materials, such as nitrogen, phosphorous, and other nutriants, and then measures the response to changes in the concentration of the nutriatnt. The classical experimental paradigm is an example of open loop thinking as opposed to a closed loop approach [15]. A stimulus variable, varying in intensity, elicits one or more responses, without thought to possible feedback effects.

The lack of interest in feed back effects appears to be ubiquitous throughout much of experimental psychology. The Skinnarians literally place a box between the experimenter and the subject, and treat the system in a black box fashion. The rest of the experimental field spends time performing open loop experimentation. The problem, of course, is that one cannot avoid feedback effects between the subject and the environment. This can lead to faulty thinking, and in the context of applications, it may lead to faulty policy formation.

Here is an example of some of the problems with the experimental psychologist's version of open loop thinking. One of the most exciting new areas of applied psychology is the evaluation of public programs and policies [16]. For example, investigators might want to evaluate the effects of a particular type of workshop on energy conservation behavior by giving different experimental groups (with a control) varying types of materials, lessons, or hands-on experience. This can be performed in the tradition experimental manner, randomly assigning people to workshop conditions, and then observing changes in conservation behavior over a specified time period.

The major problem with this procedure is the assumption that a single dose or pulse into the system has little connection with other components of behavior, and that the effects first noted in the experiment are permanent. In this area of experimental program evaluation, researchers use designs which only assess the impacts of discrete events, such as a single workshop. The design does not take into consideration the strong likelihood of

feedback effects. Indeed, Forrester has pointed out that in social systems, major changes will at first go in the desired direction. After a time, inhibiting forces, represented frequently by negative loops, dominate the system, so that eventually behavioral patterns drift back to the original level [17].

This is precisely what may happen to the experimental groups, if one waits long enough. The open loop approach assumes that a single pulse is sufficient to cause long-term changes in organizations and individuals. An alternative method method would be to (1) develop a hypothesized set of dynamic loops to account for the potential effects of workshops, (2) generate a model of the system, and (3) assess strategies for maintaining the system on target. The model can then be tested experimenally by varying the number and or timing of workshops to keep this behavior at a given level.

An advantage of the system dynamic approach to this situation is that it can explain why programs and policies succeed or fail. Moreover, one sees common mechanisms spanning many similar phenomina, so that in other applications of experimental methods, one is aware of the communality of many of these dynamic processes. In this case, new habits die out quickly, especially when the circumstances for their performance depends totally upon external events. Fig. 1 shows several examples of such a hypothesized loop structure. A person with a skin disease has notable symptoms, which may be disturbing. In fact, the person

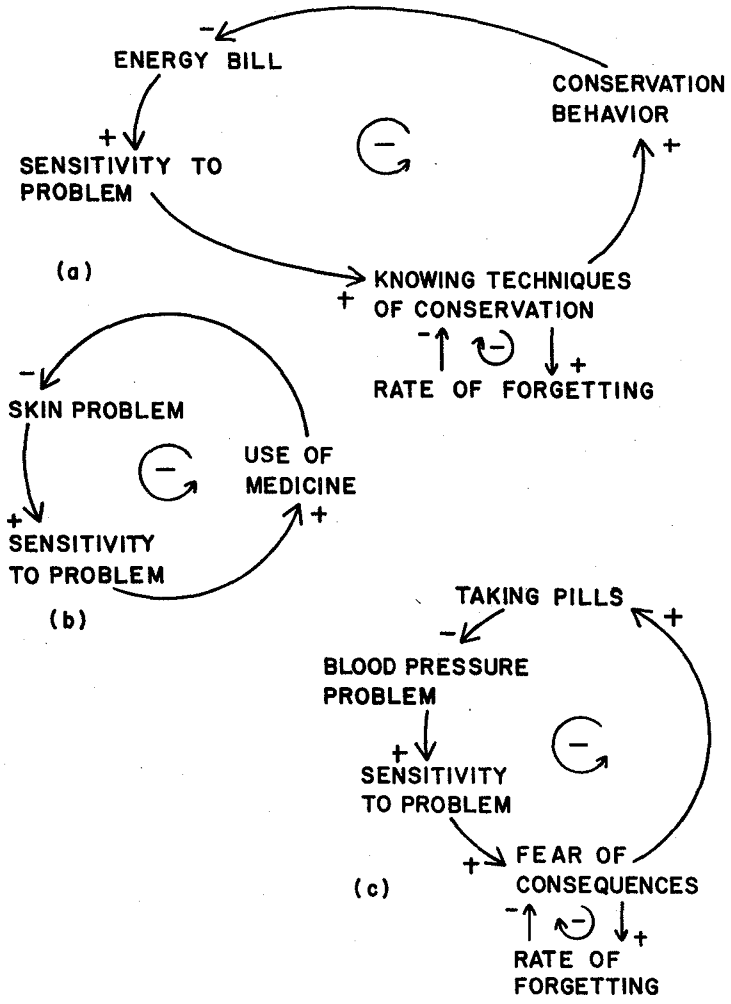

Fig. 1 Three Examples of a Similar Structual Process

may go to to a dermatologist, and begin using medicine to relieve the symptoms. The disapearance of symptoms lowers the person's sensitivty to the problem which in turn, after a time, allows the skin problem to reappear once more.

The same mechanisms (Fig. 1c) are at work in the area of high blood pressure, where physicians frequently worry about their patients neglecting to take medicine to control hypertension. Unfortunately, people with high blood pressure dis-continue taking their medicine after several months of monitoring pressure. They become somewhat sensitive to the dangers of high blood pressure, upon a routine visit to the doctor's office, and begin taking pills to keep the blood pressure level within bounds. The pills have the immediate effect of keeping blood pressure in line, but after several months of getting very positive reports, the patients begin avoid taking the medicine on a regular basis. It is interesting that a reinforcement theorist would say that being successful in lowering blood pressure by the act of taking the pills is reinforcing. This in turn should lead to the continuation of taking pills, because it is reinforcing, and not to decreasing the behavior. A simple reinforcement hypothesis leads to the wrong conclusions.

Consider again the example of the workshop experiment. First, almost any new activity has negative inhibitory processes attached to it. These indicate a behavioral counterpart to an entropy effect, so that higher the level of commitment to a new set of habits, the faster the rate of decrease in commitment occurs. Although the variables are different, this negative loop is common in physics and chemistry. The behavioral approach stresses control from the outside, and one is forced to continuously "pump" up habits by periodically retraining the subjects. The retraining process both serves to give them facts concerning how to save energy and heighten their awareness of the costs of wasting energy.

This may not be the only method for making habits more permanent. There may be ways to change the structural loops associated with the subjects behavior. In any event, a model can tell one what would be the impacts of a single pulse into the system, or indeed many pulses. Knowing that a single pulse will bring the system back to baseline leads to a much more sophisticated experimental verification of the model.

CORRELATIONAL ANALYSIS

The second paradigm in psychology is characterized by the use of paper and pencil tests or questionaires to study the implications of relationships among so-called "dependent variables." No attempt is made to use experimental methods, considering them impractical outside of the laboratory situation. Correlational analysis is based on the theory of meaurement, derived from psychometrics and multivariate analysis. In particular, applications of multivariate techniques are frequently made to the study of personality and social processes. Moreover, applicatiions of these principles have been found quite useful in

clinical and industrial areas of psychology.

Perhaps the most impressive contribution to this area of research in psychology deals with the theory of measurement and reliability [18]. Psychologists study variables which are thought to be crucial in understanding social and personality processes. Frequently these concepts are difficult to measure. The system dynamicist also has to deal with some concepts which are "fuzzy" in nature, such as quality of life. Neither group shies away from using those variables when they are thought to be important.

There are two major differences between the correlationists and the system dynamicist, beside from content area. First the correlationist, as the name implies, relies quite heavily on the notion of correlation to assess both static and dynamic relationships. This strategy has paid off dramtically in the static case. The theories of measurement and reliability have enabled the psychologist to obtain stable and relevant measures of fuzzy concepts, such as anxiety, cognitive complexity, and locus of control. Those measures, once operationally defined, can be used in a variety of situations.

The system dynamicist, as described earlier, also uses "soft" variables in modeling social problems. These variables are frequently the factors suggested and used by the clients and decision makers who are touched by the problem. At first little or no attention is made to obtaining estimates of the reliabillity of the measures used to fit the model, especially if the purpose of the model is to assess general trends and impacts of proposed policy and not for exact forecasts. The recent literature in system dynamics does address measurement error and using S/D models for quantitative forecasts [19]. For example, GPSIE, a program to the estimate parameters of S/D models, has been developed to address the problem of both measurement errors in the empirical time series and errors due to misspecification of the model.

A second difference between correlationists and system dynamicists is in the order of performing tasks. The predominant operating mode in psychology is to spend the most time on the empirical aspects of psychological research, waiting for later stages of their research or for others to put the pieces together into a coherent theory. The regression or correlation model becomes one's temporary theoretical framework until a substantive model can be formulated. This distribution of effort is also reflected in graduate training. Psychology graduate students are well versed in multivarite analysis and psychometric theory, but have little formal training in building models of substantive processes.

Waiting for theories to emerge can lead to some relatively difficult problems for the correlationist. First, one must rely heavily upon the size of correlations in the data set. Problems of the use of first order correlation coeffiencts have been pointed out before by system dynamicists [20]. Basically, cor-

relations are indices of what is happening at the surface, and first order correlations neither hold other factors constant nor effectively measure non-linear relationshps. Moreover, a new criticism has emerged, which reflects the fact that many correlation coefficients are based upon extremely small samples, at least in psychology. The size of the sampling error is so great, that most relationships cannot be detected by sample correlations [21]. Currently psychologists have been developing meta-analytic methods to combine correlation studies to increase sample size, and statistical power [22].

CAUSAL MODELING. A second problem with a predominately empirical approach to correlation analysis has appeared in using a new methodology, which psycholgists have borrowed from quantitative genetics, econometrics, sociological methodology, namely causal or structural modeling. First, there is still some confusion between static and dynamic processes. In experimental psychology, this was manifested by using between group designs when repeated measures designs were called for. In the case of correlational analysis, the confusion between dynamic and static processes is particularly evident in situations where investigators use these causal modeling techniques [23]. Frequently, this occurs when fitting data so-called non-recursive linear models, in which feedback loops have been hypothesized. Feedback, of course, implies a time process. However, often the data have been obtained at only one point in time, i.e., measurements have been taken simultaneously, through a single questionaire or paper or pencil test to cut the costs of research. In this case, change in a variable is represented as variability among subjects, not change within subjects. The assumption that static correlations are equivalent to dynamic serial correlations is risky at best. Computer programs which estimate path coefficients are completely insensitive how these correlations were obtained.

Another problem with the use of causal modeling is that invariably, in the process of hypothesizing loop structure, the correlationist may not make a commitment concerning whether the loop is positive or negative. The action of the loop is considered an empirical matter to be determined by the sample data set. Statistical programs are available to estimate loop parameters, i.e., path coefficients. Frequently, the investigator will wait to see the results of the computer run to tell whether or not a given loop was positive or negative.

The empirical "wait and see" approach to causal modeling has problems. For example, psychologists use standardized scores, i.e., scales which have a mean of zero and a standard deviation of 1.Ø, instead of the set of original measurements, raw scores. Unfortunately, statistically it is possible to find that a given loop is positive, i.e., the product of the path coefficients is positive, when using standardized scores, and the same loop is negative when using the original raw scores (or vice versa). Which is correct? There are no empirical guidelines to indicate to the researcher the appropriate

direction of the loop. Unfortunately the direction of the loop is an extremely important characteristic of any dynamic system.

The system dynamic approach to modeling hypothesizes a loop structure, as does the correlational analyst. However, this is where the methods diverge. First, in building an S/D model, the purpose of each loop is clearly delineated from a dynamic point of view. Every loop corresponds to a hypothezed feedback mechanism which accounts for growth, collapse, and reversal of direction. Thus the system dynamicist hypothesizes the direction of the loop and justifies the assumptions underlying those hypotheses. One should know whether the loop is positive or negative. In many instances one can check the hypothesized action of the loop with actual time series.

Finally, the empirical approach can lead to rather ambiguous conclusions, under circumstances where a model fits the data well, but appears to make fail many of the criteria for realism [24]. Several articles have appeared in which empirically all the loops have turned out to be positive, with no negative loops to inhibit growth. Statistically chi square tests of significance appeared to show excellent fit to cross-sectional data. However, without negative inhibitory processes, the actual behavior of the system should be quite unstable, growing infinitely large, or collapsing. In terms of validation, the model is completely misspecified, yet from a statistical point of view, it the model appears to fit the data quite well.

APPLICATIONS TO ATTITUDE CHANGE. Many of these princples can be illustrated by a simple example. An area of interest to psychologists is changing attitudes, and as a matter of fact, much of the social psychological literature during the past 15 years has been devoted to this area. The behavioristic approach to attitude change would place much emphasis upon the role of outside influences upon attitudes, which in turn might be defined as social behaviors [25]. The key mechanism is in the form of a message from the outside world to the individual. Attitude change is generated by controlling messages. Let us take then a simple behavioral model found in Hunter and Cohen [26]. Assume that the message given to a person can be measured on the same scale as the attitude itself. The rate of change in attitude, A, to can be represented by the derivative of A and might take the following form:

$$\dot{A} = (Pers)*M, \qquad (1)$$

where

Pers = the persuasiblity of the person receiving the message, and

M = the intensity of the message in attitude units.

As one can see, the rate of change in A is not a function of A itself, but only a function of the intensity of the message. Stronger messages generate more change, a typical behavioristic assumption. From a systems theory point of view, the behav-

iorist's insistence upon control from the outside leads to a very difficult time managing the attitude change process. For example, at least in this model, attitudes do not change without outside influences. Moreover, suppose a person's original attitude was -4 on a scale running from -10 to +10. If another individual attempts to get the person's attitude to +5, for example, giving too intense a message may shove the attitude beyond the target level of 5, so that one would have to reverse the sign of the attitude message to bring lower the attitude. Thus, for example, suppose someone was negative about the President of the United States, and his wife wanted to make him moderately positive about the President. If by accident she gave the President too strong an endorsement, according to the model, she would have to reverse herself and tell her husband something negative about he President to bring down her husband's attitude. There is no evidence for this type of behavior in the literature.

A simple alternative to the behavioristic approach to control of attitudes is encapsulated in the following simple linear differential equation:

$$\dot{A} = (Pers)*(M-A) \qquad (2)$$

This equation represents a feedback approach to attitude change. Hunter, Levine, and Sayres [27] have developed a more complex model which includes the dynamic effects of both external messages and internal messages that determine attitude change.

In the present simple version, the intensity of the attitude itself becomes part of the general negative loop. The larger the discrepency between the message and attitude, the more the attitude will change toward the target represented by the message. In this case, all the wife has to do to get her husband to a target level of +5 on the scale is to continue to give +5 messages. She does not keep changing the intensity and direction of the message, according to the model. Also her husband does not have of keep oscillating back and forth in finding a stable equilibrium point, while he tries to figure out why his wife is so hot and cold about the President of the United States.

This, then in summary is an example of two different paradigms concerning social behavior. The first attempts deal with the complexities of behavior by outside influences, external control, etc. The second paradign is much more theoretically oriented, and, while not denying outside influences, stresses the nature of internal structure determining the dynanmics of behavior. Psychology has gone far during the last 25 years, but it is constrained by the limitations of its methods and viewpoints concerning the dynamics of behavior. With interest in applied areas increasing, psychologists may be ready to evaluate other approaches to social problems besides extreme empiricism. Another, more balanced paradigm awaits review.

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