The Scientific Study of "Inner" Experience A General Systems Approach

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Introduction

William James, the great American psychologist, once called psychology "a nasty little subject ... all one cares to know lies outside." That was almost 80 years ago. William James was then a professor at Harvard University. At that time, psychologists had just begun to organize themselves under the aegis of the American Association of Psychologists. If the great psychologist and philosopher were to come back to life, he would probably be spellbound by the body of knowledge that has accumulated since his death. He would certainly take pride in the fact that the current American Psychological Association encompasses 36 official divisions representing more or less independent branches of psychology. He would probably note that some of these branches are more related to disciplines outside the field of psychology than to psychology itself as William James knew it then: take, for example, physiological psychology, psychopharmacology, mathematical psychology, engineering psychology, animal-comparative psychology or ethology, to mention only a few.

He would be equally amazed at the scope of application of psychological knowledge in various fields of human endeavor: industry, rehabilitation of prisoners, treatment of mental illness, counseling, marketing, management, education, organizational development, and so on. He would certainly find it hard to catch up with the ever-emerging "new" techniques carrying the promise of providing "the answers" for the ever-increasing ills of the human species.

The father of American psychology would soon come to realize that the "nasty little subject" has grown into a huge monster whose growth is both chaotic and disoriented. He would inevitably experience nostalgia for the "good old times" when scientific development was both tempered and guided by theory.

Gone are the days when psychologists took time, or had the time, to see in which direction scientific inquiry was leading them. They were then well aware

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both of the philosophical roots of their psychological theories and the moral and social implications of their work. This is not generally true today. Evaluation of the current state of psychological sciences is therefore an urgent matter. There is a pressing need to have a global view of the entire scene. One can hardly see how the rapid growth in psychological knowledge can be controlled and regulated without such evaluation. The fragmentation of psychology into increasingly more constricted specialties will only generate more knowledge about too little, and will make our trip back to the total human being impossible. Furthermore, the continual emergence of new techniques competing with old ones, without progress in theory, and often without theory at all, may compound our confusion and uncertainty. While innovation is welcome, rushing into application is not without dangers. It is often prudent to exercise a certain measure of skepticism towards innovative techniques, particularly if decisions derived therefrom are going to affect the welfare of individuals, if not the very foundations of society.

It is against this background that the present paper has been written. One of us, El-Meligi, comes from the field of clinical psychology specializing in the study of pathological experiences (El-Meligi, 1967 and 1968; El-Meligi and Osmond, 1966 and 1970; Bonneau and El-Meligi, 1974). The other author, Surkis, comes from the field of operations research, his main concern being the use of mathematical modeling in exploring the functioning of any complex system, mechanical, physical, or societal (Surkis, 1976; Surkis et al., 1970). We decided to integrate our apparently unrelated experiences in an attempt to apply modeling systems techniques to clarify our thinking about the complexities of human experience. Our objective is not to add to our knowledge about experiential phenomena. We are already overloaded with information. Rather, our objective is to demonstrate one way of organizing what we already know. We strongly believe that only by organizing our knowledge in a parsimonious and simplified fashion can we increase our grasp of the extremely complex phenomena of human experience.

It should be noted at the outset that mathematical modeling is nothing more than a tool of conceptualization and problem-solving. Like any other tool, it has its limitations. Besides, it can be either properly used or abused. To use it effectively, we must be guided by a conceptual framework (a mental map or strategy) appropriate to the nature of phenomena we happen to be interested in. The methodology applied in this paper derives directly from an approach which maximizes the use of human intelligence in studying living systems. This approach is known as "the general systems theory." The term "theory" is not to be interpreted literally. It simply denotes a methodology, a systematic way of looking at whatever we happen to be interested in. It is the purpose of this paper to demonstrate the applicability of this methodology to the study of "inner" experiences of people. We shall define later what we mean by "inner experience," but let us first explain the tenets of the general systems theory.

General Systems Theory

The term "general systems theory" was coined by an eminent biologist, Ludwig von Bertalanffy, in a classical paper which he published in **Science** in 1950. In this paper, Bertalanffy outlines an approach which was actually formulated in the thirties. The same approach has been used since in various fields—biology, botany, zoology, physics, linguistics and to a lesser degree in social sciences. Surprisingly, it has hardly caught the attention of psychiatrists or clinical psychologists. It is ironical that it was left to a biologist, von Bertalanffy himself (1952), to teach psychologists how to use general systems in their work.

According to this approach, any living entity such as a cell, an organ, an organism, an individual, a group, or a societal organization of any size or type is to be seen as a dynamic unit, or a system, which interacts with other systems, in a shared environment which constitutes a larger system (supra-system). No system can exist without other systems. Interdependence among systems is necessary both for survival and growth. Systems affect each other. Furthermore, they affect, and are affected by, the environment, i.e., the supra-system, within which they interact. Each system is also divisible into still smaller components, i.e., subsystems, which also interact with each other and with the system of which they are components.

The most important contribution of this approach is that it counteracts the longheld belief that a phenomenon can best be understood by analyzing it into its elements, or by reducing it into an ultimate cause or origin. The analytic approach, or reductionism**,** as it is sometimes called, must be complemented by an equally important mental activity, synthesis, which enables us to view the phenomenon as a whole against its background and its dynamic interaction with other phenomena. System thinking restores the integrity and the dynamic nature of any system, no matter how divisible it can be. Ackoff (1974) calls this movement of the mind expansionism, which he contrasts with reductionism:

> *Expansionism is a doctrine that maintains that all objects, events, and experiences of them are parts of larger wholes. It does not deny that it has parts but it focuses on the wholes of which they are part. Expansionism is another way of viewing things, a way that is different from, but compatible with reductionism. It turns attention from ultimate elements to wholes with interrelated parts, to* systems, (p. *12)*

Ackoff (1974) identifies three properties in any system:

> *1. The properties or behavior of each element of the set has an effect on the properties or behavior of the set taken as a whole. For example, every organ in an animal's body affects its overall performance.*
>
> *2. The properties and behavior of each element, and the way they affect the whole, depend on the properties and behavior of at least one other element in the set. Therefore, no part has an independent effect on the whole and each is affected by at least one other part. For example, the behavior of the heart and the effect it has on the body depend on the behavior of the lungs.*
>
> *3. Every possible subgroup of elements in the set has the first two properties: each has a non-independent effect on the whole. Therefore, the whole cannot be decomposed into independent subsets. A* system *cannot be subdivided into independent subsystems. For example, all the subsystems in an animal's body—such as the nervous, respiratory, digestive, and motor subsystems—interact, and each affects the performance of the whole.*
>
> *Because of these three properties a set of elements that forms a system always has some characteristics, or can display some behavior, that none of its parts or subgroups can. A* system *is more than the sum of its parts. A human being, for example, can write or run, but none of its parts can. Furthermore, membership in the* system *either increases or decreases the capabilities of each element; it does not leave them unaffected. For example a brain that is not part of a living body or some substitute cannot function. An individual who is part of a nation or a corporation is thereby precluded from doing some things he could otherwise do, and he is enabled to do others he could not otherwise do.*
>
> *Viewed structurally, a system is a divisible whole; but viewed functionally it is an indivisible whole in the sense that some of its essential properties are lost when it is taken apart. The parts of a system may themselves be systems and every system may itself be a part of a larger system. For example, a state contains cities and is part of a nation; all are* systems. *{pp. 13 and 14)*

Thus, an individual is a total system consisting of component subsystems which interact with each other: the neurophysiological system, the sensory-motor system, the affective system, and the cognitive system. These subsystems interact with each other and with the total system, i.e., the individual. But the individual is also part of a variety of societal systems; the individual assumes a more or less distinct role. To survive in a given societal system, the individual has to perform certain functions and has to meet certain expectations. Conversely, for the societal system to survive, it has to meet a minimum of its members' expectations and has to enable them to fulfill their needs and achieve their goals.

A general systems approach is nothing but a systematic mode of thinking about whatever phenomena concern us. It integrates the analytic and synthetic modes of search. In studying a given system, it allows us to move in all directions: from the total system to its constituent components, from this same system to other related systems at the same level of complexity and to a supra-system which includes them all as dynamically interacting units.

To apply this to the field of psychology, an individual could not possibly be understood simply by reducing his behavior to elements or underlying causes, physiological or psychological. The analytic (molecular) view has to be integrated with a synthetic (molar) view. This means that the individual has to be seen as a total system in dynamic interaction with other individuals, objects, events, and social groups. Concepts such as goals, roles, choices, expectations, social pressures, cultural influences, situational factors, and the like, are as essential in explaining an individual's behavior as are elementary concepts such as conditioning, stimulus-response, metabolic rate, temperament, instincts, motives, and personality traits. Pursuing an exclusively analytic mode of thinking about people precludes understanding them as living forces in a living environment.

And yet, scientific psychology followed a mechanistic and analytic model of human beings. It reached a high level of sophistication in describing the individual in terms of elemental concepts. It relied more on statistical norms than on the wholes, that is, the individuals. Consistent with the analytic approach of scientific psychology is the neglect of human experience. The subject matter of psychology has become limited to behavior, defined as the recordable manifestations of human activity. According to the typical scientific psychologist, the subjective experiences of human beings could not become a subject matter for scientific inquiry; they are not "worthy of scientific respectability." If one asks, "Why?", the answer one would get is something like this: "You cannot observe feelings, perceptions, thought processes, or any such experiences. You cannot build an objective science on inherently subjective phenomena. Therefore, we have to limit ourselves to what we can observe objectively, that is, to what is recordable and measurable."

Thus, scientific psychologists have built a body of knowledge concerning half of human life, that is, external behavior, and have discounted the other half, that is, "inner" experience. Yet it is "inner" experience that explains why people behave the way they do. Even if scientific psychology achieves perfection in describing, measuring, and correlating behavioral manifestations of people, it will not guarantee any advance in understanding the meanings of those manifestations.

Systemic thinking precludes a split of human psychology into behavior and experience. It views them as interdependent components of an integrated whole. In fact, it is impossible to draw a sharp line between external behavior and internal process. Let us take thinking as an example. Thinking may be defined in terms of internal processes such as association of ideas, manipulation of concepts, memorization, abstraction, deduction, inference, and the like. However, such internal processes are inseparable from such external (observable) phenomena as internal speech (which is easily detectable by touching the larynx), facial expressions, expressive behavior such as doodling or fidgeting, or interpersonal behavior such as talking. We will have to include also a host of physiological processes correlated with thinking.

In summary, two serious limitations are inherent in scientific psychology: first its dependence on a mode of thinking which is primarily analytic, reduction-istic, and mechanistic; second, its concern with behavior to the neglect of experience. It is ironic that a biologist, von Bertalanffy (1952), would be the one to recommend the return to the total person and to defend the legitimacy of experience as a subject matter for scientific inquiry:

> *We are able to state laws in the fields of biology, behavior, and sociology which are essentially laws of the average behavior of biological units on the cellular, organismic, and superorganismic levels. Here, however, a peculiar situation arises. Our interest in the individual is at a minimum with physical entities, and so the statistical law gives us all the information we want. Amoebas, earthworms, and even dogs as far as they are objects of the physiologist's research, are almost physical objects. My dog, however, and even the planaria which became familiar to me during some time of observation, are individuals. With human beings, our interest in the individual is at the maximum. It is true that we are able to establish exact laws even here for average behavior. For example, it is an empirical law that so many persons are killed per year in car accidents or are murdered, and demography, insurance statistics, national economy, etc., present highly elaborated systems of laws, based upon suitable model conceptions. However, our interest in human beings is not satisfied by knowing these statistical laws; we feel that another type of insight is necessary, namely, to understand the individual, as it is expressed, in the highest form, in the work of the great artist and poet. This is the antithesis between "nomothetic" and "idiographic" attitudes, between "scientific" and "understanding" psychology . . . Scientific psychology is concerned with the first attitude, and it is to it that model conceptions belong, (pp. 24-25)*

With regard to the tendency of scientific psychology to discount experience by reducing it to underlying physiological processes, von Bertalanffy adds:

> *The second limitation of model conceptions in psychology is a consequence of the fact that "inner" or "mental" experience constitutes a level of reality different from that of "outer" or "physical" experience. Our inner experience, perceptions, emotions, decisions of will cannot be reduced to action currents, hormones circulating in the blood, switching of excitations over certain synapses, and the like. The best we can hope for is to find, as far as certain aspects are concerned, a formal correspondence or isomorphy between the laws characterizing the processes in the nervous system and those found in mental phenomena, (pp.* 25-26)

Studying Experiential Phenomena

From the above, it seems justifiable to apply whatever scientific tools available to discover the laws which govern the phenomena of immediate experience. A great deal has been written about such phenomena since time immemorial. Long before psychology emerged as a scientific discipline, philosophers, writers, poets, mystics, ordinary and extraordinary people reflected on their experience. Personal accounts have always been a rich source of insights into the human psyche. More recently, personal accounts of mental patients caught the attention of Hoffer and Osmond (1961, 1962, 1966a, and 1966b) who made the first attempt to develop a measurement instrument based exclusively on patients' experiences of themselves and of the world about them during attacks of schizophrenia. El-Meligi and Osmond (1966) developed a more complex and elaborate instrument which improved both our understanding of patients' experiences and our capacity to communicate with them. This led to greater cooperation and exchange of experience between the patient and the psychologist who, according to the ethos of scientific psychology, is not supposed to reciprocate.

System Components and Interactions

The cognitive system which pertains to acquisition, organization, and manipulation of information consists of four basic subsystems: perception, fantasy (imagination), memory, and thinking. The emotional or affective system structures our feelings, preferences, likes, and dislikes. In later stages of our model-building, it may be necessary to redefine existing components in greater detail. A schematic representation of the primary interactions between system components is shown in Figure 1.

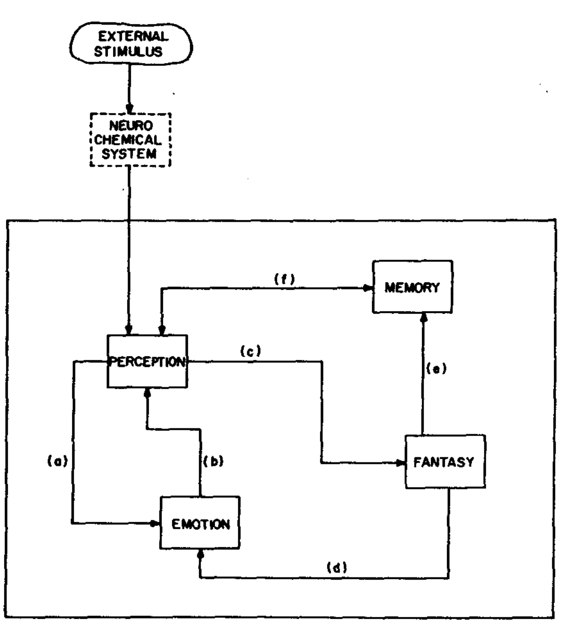
In order to explain the interactions that take place between the various components, let us take as a starting point the process of sensory perception. Sensory perception is the psychological process whereby an individual becomes aware of what goes on in his/her immediate surroundings. Awareness as a subjective experience is a state of arousal, an experience of change both inside and outside. The inflow of energy from an outside event into the brain via the sensorium and nerve cells is of course a necessary precondition of awareness. But awareness is not awareness of the physiological changes. It is awareness of something happening "out there." The individual is aroused to what is happening in his/her immediate surroundings. An outside event which constitutes significant change in one's surroundings, once perceived, energizes the total system, that is, the individual. Perceived change is correlated with emotional change.

Let us assume that outside events which initially aroused the individual continue for a prolonged period of time without significant change in quality, intensity, or rhythm. The world outside begins to appear monotonous. Perceived monotony generates an experience of apathy and diminished drive, i.e., boredom. The state of arousal gradually gives way to a state of mental and emotional dullness. (The interaction between perception and emotion is represented by part [a] in Figure 1.)

The work of Hoffer, Osmond, and El-Meligi suggests that patients' experience, subjective as it is, has structure and is governed by laws, just as are behavior and physiological processes. To discover the order underlying experience, we may start with the simple, traditional classification of experience into cognitive, affective, and conative (related to exercise of will) categories. These categories are to be viewed as complex interdependent systems. They also interact with the neurophysiological system. The latter will not be considered in this paper.

Emotional dullness diminishes the person's attentiveness to events in the immediate surroundings. It is as though the individual has lost the energy to

FIGURE 1



attend to, or to explore, what goes on in the outside world. A state of perceptual withdrawal sets in. (For the interaction between emotional excitation and perceptual activity, see section C in Figure 1.) The scarcity of sensory messages to the system may reach the level of deprivation**,** a condition which no one can tolerate for long. This condition may overwhelm the individual, who then may fall asleep or may counteract it by initiating fantasy activity, thus restoring emotional excitement to the system. (For the interaction between fantasy activity and emotional arousal, see section [d] in Figure 1.)

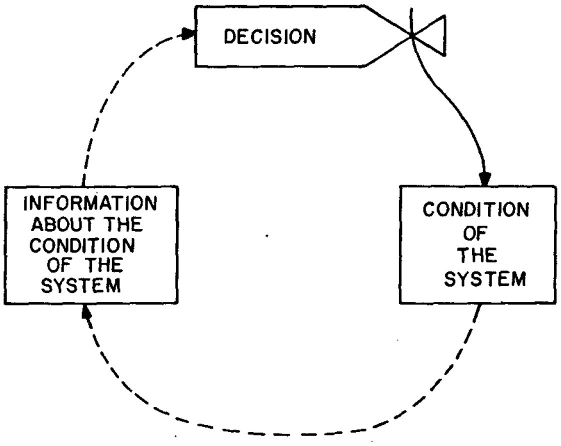
Activation of fantasy requires that the individual capitalize upon memory resources. (The interaction of fantasy and memory is represented at point [e] in Figure 1.) The flow of fantasy and memory images brings about the emotional charges associated with them. This puts an end to apathy. One of two things may occur as a result of intense engagement in fantasy. The individual may suddenly realize that he has gone too far and may shake himself off, bringing himself back to reality in a brusque fashion; or he may simply feel energetic enough to restore communication with his immediate surroundings. In either case, the "doors of perception" open, allowing sensory messages to flow into the system. Thus the level of consciousness of the world increases. (Memory and perception interaction is shown at point [f] in Figure 1.)

An example from daily life provides a concrete demonstration of our conceptualization of the experiential cycle linking perceptual, fantasy, memory, and emotional systems. You set out on a long car trip along a highway. Initially, you are alert: so much is happening around you, you are aware of the changes in your surroundings—lots of cars, stop signs, lights, street names, and the like. Concern for safety, fear of danger, and occasional anger against careless drivers constitute a drive which keeps your attention focused on immediate happenings, and inhibits fantasy, memory, and irrelevant thoughts. Now you reach the superhighway —surroundings change drastically: no more traffic lights, no more crossings or sharp turns, no more buildings, no more stop signs. You begin to travel almost in a straight line at a relatively uniform speed. Uniform scenes of nature replace the unpredictable events on city roads. A sigh of relief at the welcome change from turbulence to relative stability. Now, there is no need for taking in sensory input at a fast rate. A portion of the nervous energy heretofore expended in processing information from the environment goes into other spheres of mental activity such as thinking.

However, you have to keep an eye on the road. You continue to relate to your surroundings at a perceptual level, shifting back and forth between perceiving and thinking or daydreaming. There comes a time when the scenes that initially captured your attention by their novelty lose their impact and become monotonous. Trees begin to appear all alike; so do the cars and the road. Monotony is enhanced if you are strictly abiding by the speed limit. As monotony persists, you gradually dissociate yourself from your surroundings. This means that you spend less energy in processing sensory information. As boredom sets in, you react by indulging in fantasies, daydreams, or thinking about your life problems. The energy initially invested in perception is now diverted inwardly, that is, to mental activity.

Initially, this saves you from boredom, energizing the total system and keeping you awake and motivated. This cannot continue for too long, however, because people can get equally bored by the monotony of inner events (fantasy, memories, thoughts) as by the monotony of external events. Naturally, the cycle may be interrupted by sleep, which the driver may resist by altering body position, tensing up the muscles, and deliberately opening up the eyes, or by more drastic action such as stopping to have a walk or simply to have a nap. It is important to point out at this point that the behavior of any system at a given point of time is influenced by its own past behavior. This is a basic characteristic of mechanical feedback systems. For example, a thermostat that controls the heating system of a house responds to "information" (heat temperature attained) previously produced by the furnace or electrical heating elements. The information on the previously attained temperature level results in a "decision" which controls the "action": the level of heat to be generated to attain the "goal" (the setting of the thermostat). Figure 2 is a schematic representation of this type of simple single component feedback loop.

FIGURE 2



Generalizing from this simple example^ we can say that information about the state of the system at one point in time forms the basis for making a decision at a later point in time to alter the state of the system.

It should be noted, however, that the system that we are attempting to model, human experience, is a living system and is, therefore, much more complex in structure and much more dynamic. From the description of the primary interactions, it is clear that we are dealing with many interconnected feedback loops; the information pertaining to the state of various components of the system will have a bearing on the decision to be made for changing the condition or state of a particular component. It is this interdependence of various .components that results in the unique behavior of the system as a whole. The behavior of the latter would not be evident from an examination of the behavior of the components separately.

Once again, going back to the example of the thermostat, we can see that the actual level of the temperature in the room generates the information about the state of the room, but this information could be "delayed" (if the thermostat is placed in an improper location), or it could be "distorted" (if the thermostatic mechanism is faulty). Thus the information used to make a decision can be erroneously viewed as the system's condition, where in fact it differs from its actual state. Thus the unique behavior of the total system results from the "delays" and "distortions" in the flow of information and influences among various components of the system.

A Simulation Model

What we have tried to do so far is to provide a picture of the total structure of human experience as a global system and describe how its component subsystems interact with each other and with the total system. It should be noted that the interactions were described in qualitative terms. This is all right as a preliminary step which should lead to the description of the interactions in quantitative terms as they occur in time. This is necessary if we want a model which reflects the dynamic nature of experiential phenomena. For this reason, a set of equations has to be developed, in order that we can show how a certain set of conditions at one point in time relates to other sets occurring at later points of time.

Before explaining this modeling process we undertook in this research, it may be useful to define briefly what we mean by the two terms, "model" and "simulation."

A model consists of a body of selective information collected to study a system. The task of modeling consists of (a) determining the structure of the total system of human experience and finding out the components which make it up; (b) hypothesizing the appropriate relationships and interactions which take place within the system and between the system and other systems. The process also requires that we define the boundaries of the system and the boundaries of each of its components (subsystems). Thus, stimuli causing sensory arousal of the system are considered external to it, while perception, emotion, fantasy, memory are considered internal to the system. Also, each one of the latter four, while interrelated, has its own boundaries, making each one of them a distinct entity.

Boundaries should not be viewed as static structures physically separating each component from other components. Rather, they should be viewed as organizational efforts exerted by the total system, preventing fusion or confusion which occurs when a person does not know anymore whether he is perceiving actual happening "out there," or imagining it.

At this stage of the modeling process, we do not use any "actual data." All we need are relative measures: for example, how a perceived monotone sensory arousal pattern influences the emotional state of persons who are different from each other with regard to personality. Faster or slower rates can be expressed in numeric values.

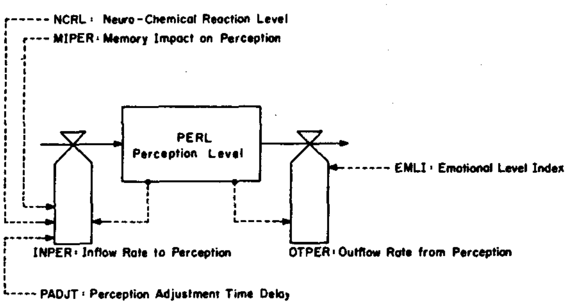
There are two types of mathematical models: static and dynamic**.** The static model displays the interactions among the components of the system when the system is in a state of equilibrium. Changing the point of equilibrium by altering any attribute of the system results in changes in the model component values. A static model yields the new values without showing the manner in which the changes took place, whereas a dynamic model displays the system and its components as they change in time. The present model is of the latter type.

We will use the simulation technique to study this system.

A simulation of a system or an organism is the operation of a model or simulator which is a representation of the system or organism. The model is amenable to manipulations which would be impossible, too expensive or impractical to perform on the entity it portrays. The operation of the model can be studied and, from it, properties concerning the behavior of the actual system or its subsystems can be inferred {Shubik, 7960). The second author has applied this technique to social and urban problems (Surkis, 1976, and Surkis et al., 1970). In our particular case, all equations of the model are solved simultaneously with steadily increasing values of time. We have chosen the simulation approach because it permits a greater degree of freedom in the construction of the model. The simulation technique does not isolate relationships between elements, but indicates the way in which all system elements change over time. In order to understand the relationship that exists between variables and study the sensitivity of system parameters, several simulations have to be performed. Therefore, one can view the simulation technique as a mathematical substitute for experimental manipulations of variables. In obtaining the state of the system over many time periods, calculations were conducted by digital computer. Several programming languages have been designed to perform the required tasks. In our simulation experiments, we used the DYNAMO language (Pugh, 1966).

In our model, system components may be viewed as tanks or reservoirs whose contents vary over time. For instance, we may view the perception component as a reservoir reflecting the level of sensory impact reaching our consciousness through the medium of the neuro-chemical system (sensory and brain mechanisms). The level of this reservoir would vary over time depending on the inflow and outflow decisions. The decisions which change the level of the reservoir may be viewed as valves that regulate the reservoir level. The rate of flow through these decision valves depends on the nature of interactions among various system components. In the perception subsystem, the inflow valve would be regulated by the state of the recognized sensory messages received via the neurochemical system, an adjustment or delay time, the impact of the state of the memory component, and the current level of sensory arousal (see Figure 3).

FIGURE 3



The parameters of delay and memory intervention can be varied to reflect individual differences in intellectual level, cognitive styles, temperament, emotional stability, and others. We note that the inflow rate is influenced by other system levels as well as by the level of the system receiving the inflow.

Technically, level equations can be represented by integrating equations that sum up the net result of past rates of change in the level:

$$\text{PERL} = \text{PERL}\,(t=0) + \int_{t=0}^{T} (\text{INPER} - \text{OUTPER})$$

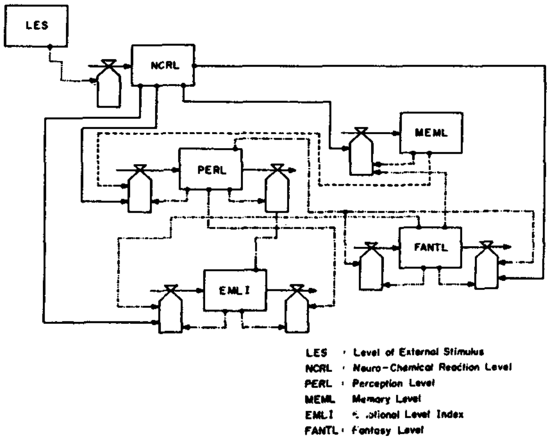
PERL = Perception Level
INPER = Inflow Rate into the Perception Level
OUTPER = Outflow Rate from the Perception Level

This equation represents a "snapshot" of the perception reservoir at a particular point in time. New values of the level equations are recalculated at closely spaced (Δ t) intervals over time. It is obvious that the closer the "snapshots" are from each other, the more accurately can we monitor the system levels. The outflow value of the perception reservoir is regulated both by the perception level itself and the level of the emotional index. The emotional index, in turn, is influenced by the perception level. This feedback action is due to the interdependence that is assumed to exist between the perception and emotion components of the system.

The rate equations that regulate the inflow and outflow consist of expressions that govern the rate of flow in the next (Δ t) increment of time. The expressions in the rate equations would make use of various parameters and values of system levels at the current time.

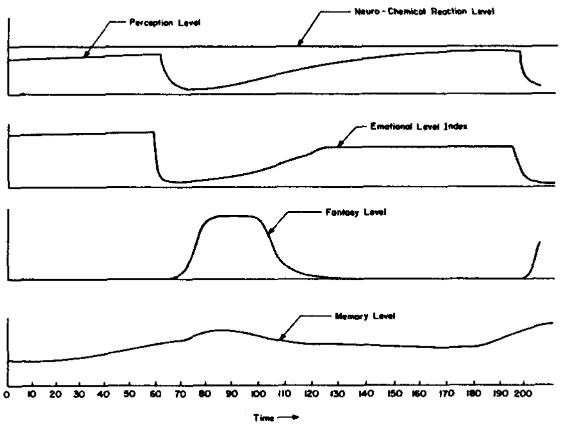
Other level and rate equations have been developed along similar lines. Once the necessary equations for every component, using the interaction links, have been formulated, we can proceed to apply an appropriate simulation language (DYNAMO, in this case) to trace the total behavior of the system step by step over time (see Figure 4). The simulation run will yield numeric output for every variable and component level. Graphic output can also be obtained. Let us now examine the graphic output derived from one such simulation run.

FIGURE 4



In Figure 5, we notice that the incoming level of perception is a reflection of the monotone sensory arousal pattern as we indicated above. The apparent perception level, with a certain delay, attempts to reach the level of the recognized perception level.

FIGURE 5



Just prior to time = 60, the emotional index begins to drop (the rate of drop of emotional excitation over time is a functional relationship that reflects individual differences in character makeup, temperament, and the like). This change in the emotional excitation level causes a steep decrease in the perception level at time = 62. The drop in perception level "triggers" fantasy activity at time = 70. Once again, delay in the activation of fantasy component and the intensity of the fantasies are contingent upon several factors: temperament, interests, cognitive styles, physical energy, and so on. Note also that the memory level adjusts very slowly to changes in the levels of perception and fantasy. It will also be seen from Figure 5 that as memory and perception levels begin to differ (around time = 90), the perception component is signalled to receive the monotone stimuli. Receptivity of sensory stimuli is accelerated when the emotional index begins to rise in response to the produced fantasies.

Conclusions

The model as described above represents our first attempt to demonstrate the use of mathematical modeling techniques in systematizing the growing body of knowledge about phenomena of experience, or consciousness, as referred to by some. The model presented is preliminary and has been deliberately limited to a constricted area of experience: sensory arousal, perception, thinking, fantasy, and memory. We have used traditional terminology of psychological functions which have been studied by generations of psychologists and philosophers alike. The General Systems Theory provided the approach to the phenomena in question.

People are both behaving and experiencing agents. Behavior and experience are inseparable. External behavior is observable, and experience is communicable. A complete science of psychology has to integrate both. It has to rely on both observation and introspection as equally valid means of understanding people.

A psychology which limits its subject matter to "recordable" behavior is a onesided science, a descriptive science with externally imposed explanations. The legitimate explanations of "recordable" behavior must be derived from the subjects' experiences of themselves in relation to the world about them.

What we are suggesting is the integration of both approaches: the objective and subjective. This is only possible if the experiencing subject is recognized as an indispensable agent in the scientific enterprise. It does not matter whether the subject is adult or child, mentally fit or disturbed. In fact, the need for the subject's participation increases the farther away he/she is from our norms. This is because the inner worlds of people become increasingly difficult to penetrate through sheer observation, empathy, or inference as they become more and more different from our more-or-less normative experience.

It is this insight which prompted psychologists like Piaget to build his practice of child psychology on dialogues with children and in limited numbers. No psychologist would question the fruitfulness of Piaget's method: dialogue between equals, or between two "subjectivities" as pheno-menologists like to say. It is the same insight that prompted Hoffer, Osmond, and El-Meligi to take advantage of psychometrics in systematizing their dialogues with mental patients.

However, the present authors believe that it is not enough to evaluate patients' experience using psychometric method in diagnosis, prognosis, and treatment. They believe that the accumulating body of knowledge from the experientially-oriented instruments calls for theoretical systematization. Only through such efforts can we discover the structure and dynamics of experience under varying conditions: environmental, neuro-physiological, drug-induced, stress-induced, hypnotic, psychedelic, schizophrenic, or otherwise. Theoretical progress in understanding experience will undoubtedly lead to the development of tests which are sharper in focus and more effective in revealing the many strange worlds of people who need our help.

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