CONCEPTS OF: STRUCTURES; SYSTEMS; DYNAMIC SYSTEMS; THEORETICAL SYSTEMS; OPEN SYSTEMS AND CLOSED SYSTEMS; EQUILIBRIUM; HOMEOSTASIS; INPUTS; OUTPUTS; OPERANTS; RESPONDENT BEHAVIOR; AND TRANSFORMS.

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Introduction:

The above are concepts that are useful as background information in attempting to understand human psychological functioning from a systems-cybernetics-information theory point of view.

Life is the interplay of many and varied systems that operate at different levels of function. From a biological point of view at a primary elementary level one has biochemical systems. At a secondary elementary level one has cellular systems. At more complex levels of operations one then has tissue systems; organ systems; and the integration of organ systems such as the cardio-respiratory-vascykar system and finally one has the organism itself.

In terms of psychological function one also sees a hierarchy of interacting systems. One way of attempting to understand normal function and malfunction is to look at and attempt to understand the systems that are involved; understand how they interact with and at times are dependent on other systems; understand how these systems evolve; and understand how they can be broken down and at times reorganized.

Structures (Psychological Structures)

A psychological structure is a mental system or totality composed of parts. In this system the parts are integrated in such a manner that this structure's principles of operation are different from the principles of operation of any of the parts. Thus psychological structures are not built up from simple additions or simple elaborations. Psychological structures are built up from an integration of component parts (elements). This integration or synthesis may involve previously existing components or new components or both. To form a new structure it is necessary to integrate the component parts in such a manner as to form a new principle of operation, or a new principle of activity. (Ref. - "Six Psychological Studies" by Jean Piaget, Random House, N. Y., 1967.)

The personality can be viewed as a structure that is organized from components that are related to each other so as to form an organized whole. Components of personality can also be viewed as structures or sub-structures much like the structures or sub-structures of a building or machine.

System:

A system is a set of orderly and persisting interrelations between the parts of a whole. In a system the parts work together in an integrated manner to perform a specific function. The component parts of a system may be interlocking and interdependent.

Systems exist at all levels of function from simple chemical or molecular interactions to complex international political-economic systems. Systems may and often do interact with other systems. Living systems need to interact with other systems to sustain life.

Dynamic Systems: In a dynamic system one can see interrelationships between the parts. The interrelationships tend to persist in a relatively stable manner. The energy interchange among the parts may vary within wide limits, but the patterns of relationships of the parts remains essentially the same. Parts may be replaced from time to time as in metabolism, a work group, or in a religious belief.

Theoretical Systems:

A theoretical system is one that is generally made up of a number of interlocking theories or beliefs. A well-organized paranoid delusion can be viewed as a theoretical system possessed by one person; or in the case of folie a deux a theoretical system possessed by two people. Many religious, political and economic systems and scientific theories may be viewed as theoretical systems.

Open Systems and Closed Systems:

An open system is one that is open to energy input or information input from without. Living plants and animals represent examples of biological open systems that need continual or intermittent energy input for survival. A psychological, political or economic open system is one that would allow information input from external sources to enter the established system.

In life there are few totally closed systems. Most atoms may be viewed as relatively closed systems - e. g. they don't take in outside energy. Yet some atoms are unstable and may be altered by energy input - e. g. U-235 and U-238, heavy hydrogen, and the half life of various radio-active elements. A relatively closed psychological, political, economic, or religious system is one that allows little information input from external sources. In humans the paranoid psychotic patient with a well-organized delusional system allows little information to enter that contradicts his delusional system. Other types of systems (political, economic, religious, or alleged scientific) may in a like manner tolerate little information input that contradicts the established system.

Inputs: Inputs are the energy or aliment, entering a system from external sources. In biological systems inputs are food, water, vitamins, etc. In psychological systems inputs are sensory stimuli and related bits of information or they may be more complex Gestalts.

Outputs:

Outputs are products produced by the system (man, animal or machine). Outputs may be in terms of signals (symbols) produced, glandular products (secretions), or motor activity in terms of movement and energy. The response to stimuli is an output in response to an input. Outputs may show varying degrees of organization and intention.

Equilibrium: (to balance):

An equilibrium is a relatively stable state or condition in which opposing forces are balanced. In an equilibrium the current state lacks a tendency to evolve into something else. An equilibrium may not be absolute or static, but relative. In a relative equilibrium the initial state or condition may be temporarily or slightly altered but soon restored by balancing forces.

Homeostasis: (homo = similar or like; stasis = standing still or no change)

Homeostasis is the process of maintaining a constancy of relations or relationships. In biology this means maintaining an equilibrium or a fairly constant ratio between input and output for energy, salts, minerals, and other nutrients. Homeostasis is the tendency of the organism to remain the same or if disrupted, to return to its former state. Dr. Walter B. Cannon, a physician and physiologist, developed the concept of homeostasis through his work on the automatic regulatory functions of the human body. His work with the autonomic nervous system and

neuroendocrine systems laid the physiologic groundwork for the understanding of psychosomatic medicine and the effects of stress and emotion on internal systems. (Ref. - Cannon, W. B., "The Way of an Investigator", W. W. Norton & Co., Inc., New York, N. Y. 1945)

Progressive Equilibrium:

A progressive equilibrium appears to be a contradiction of terms. However, if inputs bring about slight changes in relatively stable states, the organism is not in a true or pure state of stable equilibrium. The input alters the internal state and produces a new and slightly different state. This new and relatively stable state may also be slightly modified by other inputs. In such a situation one sees a state that is relatively stable, and yet changes from one state of relative equilibrium to another. If this occurs in a progressive way we can call this a state of progressive equilibrium.

Operants:

Operants (bits of operant behavior) can be viewed as established patterns of function. An operant behavior is identified by the effect of this behavior on the environment. These bits of behavior (operants) can at times be further modified by input. After the modification or transformation has taken place one no longer has the original operant.

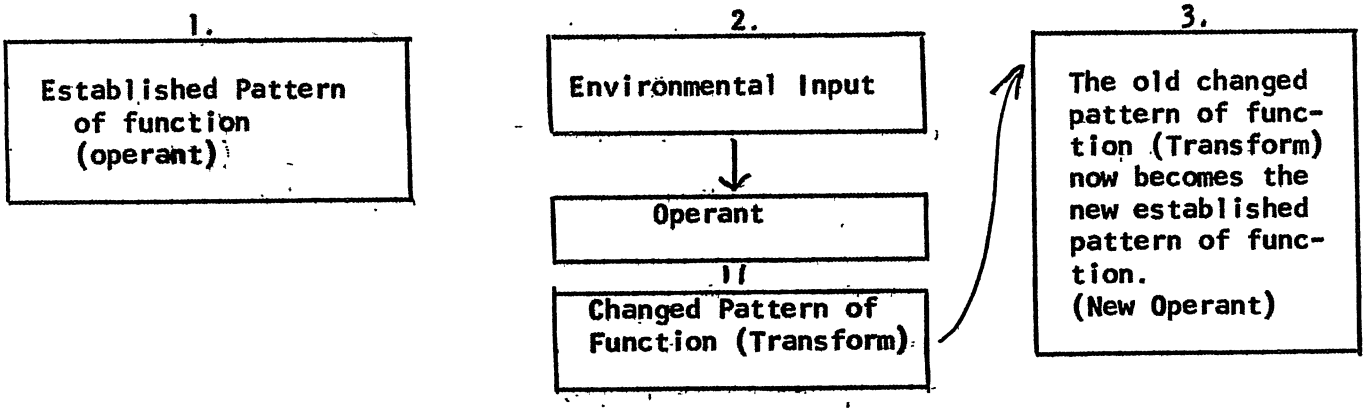
Respondent Behavior:

Respondent behavior is the result of a transformation taking place in the system of organization of the operant as the result of environmental input (stimuli). Respondent behavior is identified with the specific eliciting stimulus.

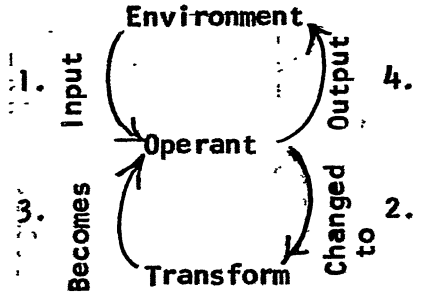
Transform:

When an operant is transformed by environmental feedback (input) one has a bit of respondent behavior (e.g. newly transformed behavior) we may call a transform. These new bits of behavior may not be static, but may also be further modified or further transformed. Thus when these transformed operants (transforms) start interacting with input from the environment they function as and become operants that can be further modified or further transformed. Thus when newly formed transforms interact with the environment before the environment has acted on them to further change them we call them operants. What at one moment is a transform a moment later becomes a new operant.

We may visualize this as follows:



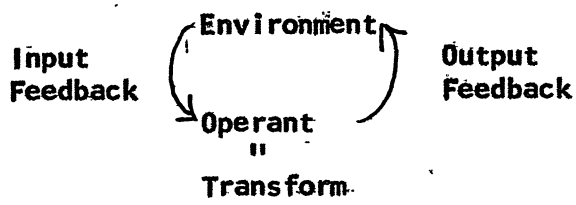
Or, visualized another way:



Thus the cycle of change that evolves is 1 → 2 → 3 → 4 → 1 → 2 → 3 → 4 → 1→ etc.

1, 2, 3, and 4 can be viewed as interactive processes which may maintain or change an equilibrium or pattern of homeostasis.

Information fed back from the environment (input) may stabilize the operant rather than provide a type of input that causes the operant to be transformed.



In this situation the operant and the transform may be the same.

Alterations in input feedback, or output feedback may disrupt the equilibrium between operant and transform and again restore the previous pattern or cycle. This would result in operants being transformed into new operants.