

Cosmological psychology: An evolutionary framework
for the emergence of the hierarchical mind

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Cosmologists tell us that the cosmic clock started some 13.8 billion years ago when an unimaginably powerful primordial singularity of pure energy exploded into the Big Bang that created our known physical universe (Hawking, 1996). Cosmologists also tell us that Earth was created some 4.6 billion years ago as the third planet of an apparently unremarkable solar system whose central star is but one of some 150 billion other stars in our 100,000 light-year-wide Milky Way galaxy. The axiomatic proposition put forth by physicists that our universe began with the creation of space, time and energy as an exploding point-event has been adopted as the basis for our Stage 1 of cosmic evolution. Simply put: Stage 1 is based upon the Big Bang model's assumption that cosmic evolution began with pure, primordial energy.

Physics

Physicists tell us that:

"Physics, the oldest and most basic of the sciences, is the science of matter and energy and of the relations between them. The domain of physics includes matter in all its forms---solids, liquids, gases, plasmas, molecules, atoms, and the particles out of which atoms are made. It also includes energy in all its forms---mechanical, electromagnetic, nuclear, thermal, and radiant energy. Physicists attempt to understand these different kinds of matter and energy that constitute the universe". (Mulligan, 1991). In our model, Stage 2 of cosmic evolution is based upon the idea posed by physicists that at the most fundamental level the universe is composed of energy-by-matter interactions.

Biology

Biologists tell us that hierarchically-organized life has continuously existed on our planet for some 3.8 billion years. Biologists also tell us that all life displays eight

shared and fundamental characteristics: a precise organization, metabolism, homeostasis, movement, responsiveness, growth, reproduction and adaptation (Villem, Solomon, & Davis, 1985). Addressing themselves to the field of biology as "...the science of life...", Wessells and Hopson (1988) based the organization of their textbook "...on the levels of organization within a living entity and its environment"... and asked:

"What exactly is life? One way to answer this question is to construct a list of characteristics that put some boundaries around this elusive concept we call life. Living things have a complex organization. Living things take in and use energy. Living things grow and develop. Living things reproduce. Living things show variations based on heredity. Living things are adapted to their environments and ways of life. Living things are responsive". (Wessells & Hopson, 1988, p. 3)

The importance of the overarching organizing principle of the concept of evolution in the study of life was stated in these words:

"One other very special feature of living organisms is their history. Every living thing on Earth today is a descendant of an organism that lived before it. Each is a member of an unbroken lineage stretching backward in time to the era, billions of years ago, when life processes became associated with organized sets of matter. Thus, a knowledge of evolutionary history is important to our understanding of many characteristics of present-day organisms". (Wessells & Hopson, 1988, p. 7)

Based on the fundamental nature of life on our planet, our model of cosmic evolution posits a Stage 3 based upon the energy-by-matter-by-life interaction.

Psychology

Psychologists tell us that: *"Psychology can be defined as the scientific study of behavior and mental processes".* (Atkinson, et al., 2000) The main areas of study in the field of psychology include: sensation, perception, emotion, motivation, cognition (memory, learning, problem-solving, etc.) and personality. At the level of psychological organization, the ancient mind-body problem poses the still unanswered question of how the physiological neural activity of the brain produces the psychological activity of the mind, its consciousness and its behavioral responses? Stage 4 of our model of cosmic evolution is based upon the idea of an energy-by-matter-by-life-by-mind interaction.

Sociology

Sociologists tell us that: “*Sociology is the scientific study of human behavior in groups and of the social forces that influence that behavior*”. (Doob, 1991, p. 4) Among the still unanswered questions of sociology is the question of how individual humans come together to collectively produce the complex social behaviors and value systems of human cultures? It is through the process of socialization that every human culture attempts to assure that its young will indeed acquire the positive behavioral characteristics that are valued by each individual culture. Stage 5 of our model of cosmic evolution is based upon the process of socialization and it is an attempt to elaborate the energy-by-matter-by-life-by-mind-by-culture interaction.

Levels of organization

Based upon the above considerations of the basic scientific disciplines, a new cosmological psychology shall be presented as the cosmic evolutionary framework containing the local Darwinian and Lamarkian emergence of the hierarchically-organized human mind. Based upon the premise that the physical universe is fundamentally composed of: energy, matter, life, mind and culture; a metatheoretical cosmological hypothesis of mind shall be elaborated that views the emergent hierarchically-organized human mind as composed of four interactive levels of organization: physical, physiological, psychological and sociological. Before turning to considerations of each level of organization, an overview of the framework of cosmological psychology shall be presented in Figure 1 that shows the cosmic evolution of the universe.

A metatheoretical framework

Figure 1 is a metatheoretical Einsteinian space/time diagram showing the future light cone that was upwardly generated in the time dimension as the universe expanded in three-dimensional space from a single point at the moment of its Big Bang creation to an observable radius of approximately 43 billion-light-years at the present time due to the fact that the universe has expanded since its creation. Using the same criteria currently employed by physicists to produce Minkowski-type light cones (see Hawking, 1996, p.35), Figure 1 was produced by collapsing the 3 spatial dimensions into one 2-dimensional plane and projecting the time dimension in the vertical plane.

Figure 1 here

In Figure 1 the emergence of mind is taken to be an integral part of the cosmological evolutionary progression set into motion some 13.8 billion years ago when our universe probably began in an incredibly hot and unimaginably dense point-event of pure, primordial energy; energy somehow rather quickly expanded and cooled down enough for matter to exist and thereby formed the energy-by-matter multiplicative interaction that still constitutes the physical foundation of our present-day universe; some 3.85 billion years ago the energy-by-matter interaction somehow created the life forms that have continuously existed on our planet from almost as soon as it cooled from the original heat of its creation; some several million years ago energy, matter and life combined to produce the energy-by-matter-by-life interaction that very soon began to set down the antecedent conditions for the emergence of the primary/individual/inherited mind; and finally, some tens of thousands of years ago, the social networks produced by the cumulative interactions of individual human minds created our human cultures which today serve as the foundations for the developmental emergence in our young of the learned acquisitions which constitute the secondary/collective/acquired mind that over time transforms neonatal homo sapiens into socialized adults.

Figure 1 is essentially a schematic representation of our five-stage theory of cosmological evolution that is based upon the distinction between biological natural selection and cosmological natural selection. ***IF***, one of the fundamental insights of the 19th Century was the thesis that groups of living organisms differentially evolve over periods of millions of years by biological natural selection so that descendants come to differ morphologically and physiologically into separately organized new species (see Darwin 1859; deDuve, 1995); ***then***, perhaps one of the fundamental insights of the latter part of the 20th Century will prove to be the thesis that biological evolution of Earth is part of a universe-wide cosmological evolution whereby groups of astrophysical objects differentially evolve over periods of billions of years by cosmological natural selection so that astrophysical descendants come to differ morphologically and chemically into separately organized new forms of: asteroids, comets, planets, stars, galaxies, galaxy-clusters, and galaxy super-clusters (see Hawking, 1996; Kutter, 1987; Smolin, 1997). Therefore, in cosmological psychology the hierarchical human mind and its consciousness is taken to be part of the biological evolution on Earth which, in turn, is taken to be part of the cosmic evolution of the physical universe.

In this cosmological psychology of the hierarchical mind, the primary/individual/inherited mind is an emergent product of Darwinian evolution promulgated by the mechanism of natural selection of inherited mental potentialities transmitted by the process of DNA/RNA human genetics; whereas the secondary/collective/acquired mind is an emergent product of a Lamarkian-type of evolution promulgated by the mechanism of human selection of accumulated cultural knowledge socially transmitted through human learning to each successive generation from the moment of birth. In this view, primary associative learning processes (Montare, 1988;1992;1994;1996) produced by the directly sensed and perceived non-language signals of concrete reality predominate at the psychological level of organization of the energy x matter x life x mind interactions to produce the individual/primary/inherited mind. In contrast, it is theorized that secondary signalization associative learning processes (Montare, 1988; 1992;1994;1996) produced by the indirect/language-based “signals of signals” (Pavlov, 1957/1952) that comprise abstract reality predominate at the sociological level of organization of the energy x matter x life x mind x culture interactions that produce the collective/secondary/acquired mind.

Stages and levels of cosmological evolution

Figure 2 elaborates Figure 1 to include the notion that each fundamental interaction term marks a stage of cosmological evolutionary development at each stage of organization.

Figure 2 here

In figure 2 **genesis** presumably occurred at the moment of the Big Bang which formed the primordial level of organization of pure energy; then **cosmogenesis** marked the birth of matter when the universe cooled down enough for matter to exist and the formation of physical level of organization comprised of the energy-by-matter interaction; then **biogenesis** signaled the beginning of life and the physiological level of the energy-by-matter-by-life interaction; then **psychogenesis** marked the beginning of the individual primary mind at the psychological level of organization of the energy-by-matter-by-life-by-mind interaction of the primary mind; and finally, **sociogenesis** signaled the formation of the collective secondary mind at the sociological level of organization of the energy-by-matter-by-life-by mind-by-culture interaction.

Evolution of time and space

Figure 3 is a further elaboration of the ideas inherent in Figures 1 and 2 that attempts to show the cosmic evolution of events from the first primordial events at the Big Bang through to the social events that occur at the present time. At each level of organization, events that occur in serial order require the processing of **successivity** of events; whereas events that occur at the same time require the processing of **simultaneity** of events. The events that occur at the first two lowest levels of organization are universal; whereas the events that occur on the three higher levels in Figure 3 are events that happened on planet Earth. The time periods covered range from 10^9 years ago at the time of the Big bang to 10^4 years ago at the time of the beginning of culture.

Figure 3 here

An S-O-R formulation of the cosmological hypothesis of mind
 The essence of the cosmological hypothesis of mind is that the nature and structure of the hierarchically-organized mind may be examined within the S-O-R formulation that contains the processing of physical, physiological, psychological and sociological events.

Hierarchical processing of physical events

According to physicists, the fundamental entities that underlie all physical events in our universe are: energy, matter and the energy-by-matter interaction (Mulligan, 1991).

Figure 4 here

The thesis underlying Figure 4 is that: if, physical events occur on a continuum which extends from the successivity of time/space events to the simultaneity of space/time events; then, a fundamental requirement for the evolution of both animal and human minds is that successfully-adapted organisms must be capable of processing both successive and simultaneous physical events. The lowest level in Figure 4 is the sensitivity and reactivity to physical events that allow for survival. The mechanism for human sensitivity/reactivity is the familiar abstraction of the reflex arc composed of: receptors, afferent neurons, central nervous system, efferent neurons and effectors. The second level shown in Figure 4 is the capacity to process simultaneous events that may well be centered in the right

hemisphere of the human brain. The third higher level shown in Figure 4 is the capacity to process physical events that occur successively that may well be centered in the human left hemisphere. At the top of this proposed hierarchy is the capacity of humans to profit from experience that is shown as reflection. Reflection has been presumed to the empirical basis of mind since the days of Aristotle.

Hierarchical processing of physiological events

As we have seen, the fundamental properties of life are: morphology, metabolism, homeostasis, responsiveness, movement, growth, reproduction and adaptation (Wessels & Hopson, 1988). If, the stimulus products of the fundamental properties of life may be combined into the concept of physiological events; then, another essential prerequisite for the evolution of the human mind is that it must be able to successfully process stimulations emanating from these physiological events in order to be able to respond with regulation and control of voluntary and involuntary physiological-level processes. Figure 5 incorporates these ideas into a hierarchical pyramid which represents one way of attempting to account for the processing of physiological-level events by human nervous tissues.

Figure 5 here

The core unanswered question of exactly how neural brain processing is transformed and transcended to become the activity of the human mind can be first asked at this physiological level of organization. In Figure 5 it is assumed that the ANS, the PNS and the lower tissues of the CNS comprise the foundational level for the processing of physiological-level events. The right hemisphere is assumed to have evolved in humans as the predominant (not exclusive---but predominant) structure for processing of the processing of simultaneous physiological-level events. The left hemisphere is assumed to have evolved in humans as the predominant structure for processing successive events. It is herein assumed that the physiological precursor for the subsequent development of human language was the capacity to serially process events in the left hemisphere. At the top of this hierarchy is placed the whole brain because in intact, successfully functioning humans the highest integration of neural activity is presumably a function of whole brain organization.

Hierarchical processing of psychological events

Figure 6 shows another hierarchical pyramid which represents one way of attempting to account for the processing of psychological-level events. Among the fundamental psychological processes of the living, behaving and thinking human organism one may enumerate: sensation, perception, emotion, motivation, cognition and cognizance (see Atkinson, et al, 2000).

Figure 6 here

Human cognition may be taken to include the study of: sensation, perception, emotion, motivation, cognition, cognizance and personification. Human cognition and cognizance may include: conditioning, learning, memory, language, thinking, reasoning, problem-solving and general intelligence. It is the thesis of this paper that at the core of human cognitive functioning there exist four phylogenetically and ontogenetically emergent, hierarchically-organized, interactive forms of human ideation: sensception (see Montare, 1996), perception, perception and conception (Montare, 1992; 1994; 1996). The concept of the unified self sits atop this hierarchy of fundamental psychological processes and is herein taken to be an example of the Gestalt principle that *'the whole is greater than the sum of its parts'*. Underlying the core of Figure 6 is the concept that the unified self at the psychological level of organization represents the necessary foundation for the development of an ancient, individual primary mind and consciousness.

Hierarchical processing of sociological events

According to sociologists, sociological events are the manifestations of the patterns and processes of human social interactions that comprise the study of sociology (see Doob, 1991; Stark, 1996). Figure 7 shows a hierarchical pyramid which represents one way of attempting to account for the processing of sociological-level events by individual humans.

Figure 7 here

Given that human neoteny means that humans are born in a state of regressed physiological development and thus totally incapable of independent survival; it follows that survival of the human neonate depends upon the intervention of social agents and that human biological growth and psychological development must occur within cultural groups. It is a thesis of this paper that human social groups which display fundamental properties of social interaction and organized

patterns of collective behaviors constantly interact with the developing young human primary mind and its consciousness by the production of myriad stimulations which may be conveniently subsumed under the concept of “experienced sociological-level events.” If, the influence of culture upon the individual human mind may be expressed as the concept of experienced socio-cultural events; then, another fundamental prerequisite for the evolution of human mind and consciousness must be the capacity to successfully process these sociological-level events. Figure 7 shows a proposed distinction between the emergence of a precursor individual primary consciousness and a subsequent evolving collective secondary consciousness. It is theorized that the primary consciousness shown in Figure 7 arises from the capacity of the primary mind to successfully process psychological-level events; whereas the secondary consciousness shown in Figure 7 arises from the capacity of the secondary mind to successfully process sociological-level events (Montare, 1996). In this formulation, primary consciousness is physiologically generated within the individual primary mind by ensembles of ***neurons*** that acquire knowledge predominantly by nonverbal primary signalization associative learning processes; whereas, secondary consciousness is originally socially generated amongst social, secondary minds by collective cultural ensembles of ***brains*** that create socially-shared systems of language which can be transmitted to new generations of the group who thereby become capable of continued knowledge acquisition by the use of verbal secondary signalization learning processes. The essence of these assumptions is that learning that occurs at the level of primary consciousness predominantly ***without*** the use of language combines with the learning that occurs at the secondary level of consciousness predominantly ***by*** the use of language to produce the totality of the cultured hierarchical human mind.

Summary

Figure 8 shows the S-O-R formulation when figures 4, 5, 6, and 7 are placed beside each other into one diagram that shows the S for stimulations, the huge O for organism and the R for response. Finally, Figure 8 is our proposal to attempt to account for the emergence at the center of this four sided formulation of a hierarchically-organized human mind capable of contemplative reflection by wholistic brain processing, within an integrated unified self in control of its responses to physical, physiological, physiological and sociological inputs; that can operate with the full cognizance of conceptual consciousness. Further attempts to

elaborate the intra- and inter- relationships within Figure 8 are underway at the Human Learning Laboratory.

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Figure 1 – The cosmic evolution of the universe

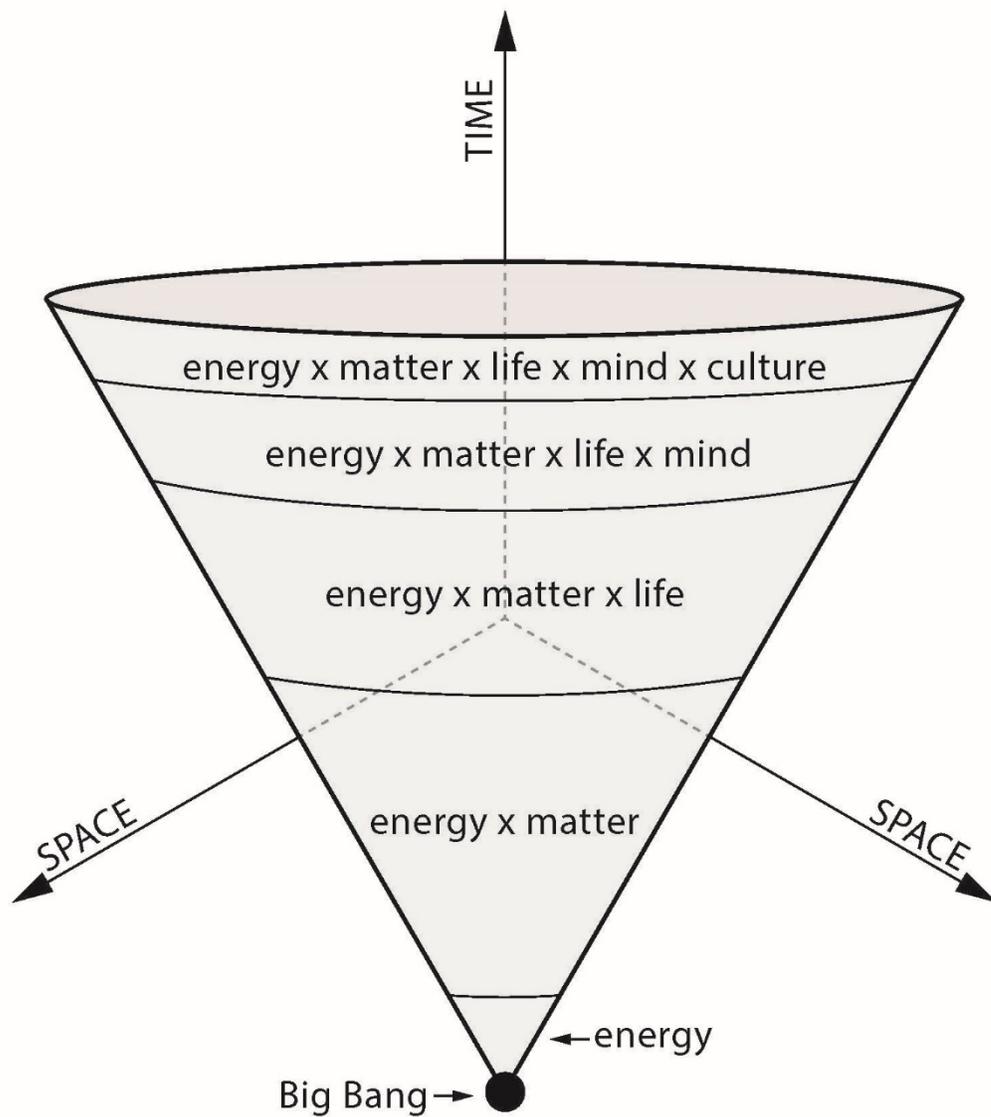


Figure 1 - The Metatheoretical Framework

Figure 2 - Stages and levels of organization of cosmological evolution

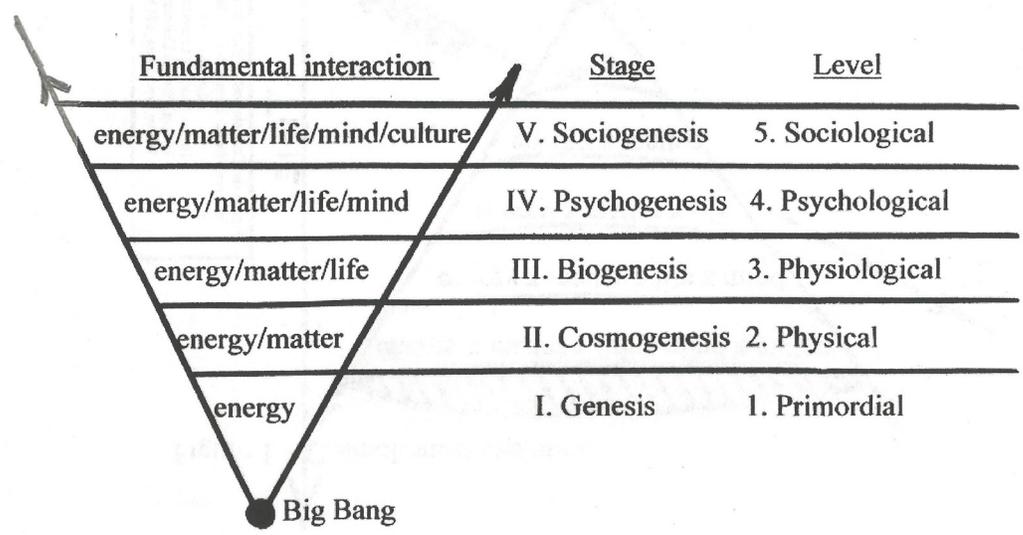


Figure 3 - Evolution of the time/space continuum.

	Event <u>Successivity</u>	Event <u>Simultaneity</u>
e/m/l/m/c	social events= social time/space (10 ⁴ years)	social space /time (planet Earth)
e/m/l/m	psych. events= psych. time/space (10 ⁶ years)	psych. space/time (planet Earth)
e/m/l	physio. events=physio. time/space (10 ⁹ years)	physio. space/time (planet Earth)
e/m	physic. events=physic. time/space (10 ⁹ years)	physic. space/time (universe=15x10 ⁹ lt.yrs.)
e	prim. events = prim. time/space (10 ⁹ years)	prim. space/time (Big Bang-15x10 ⁹ lt.yrs.)

Figure 4 - Hierarchical processing of physical events

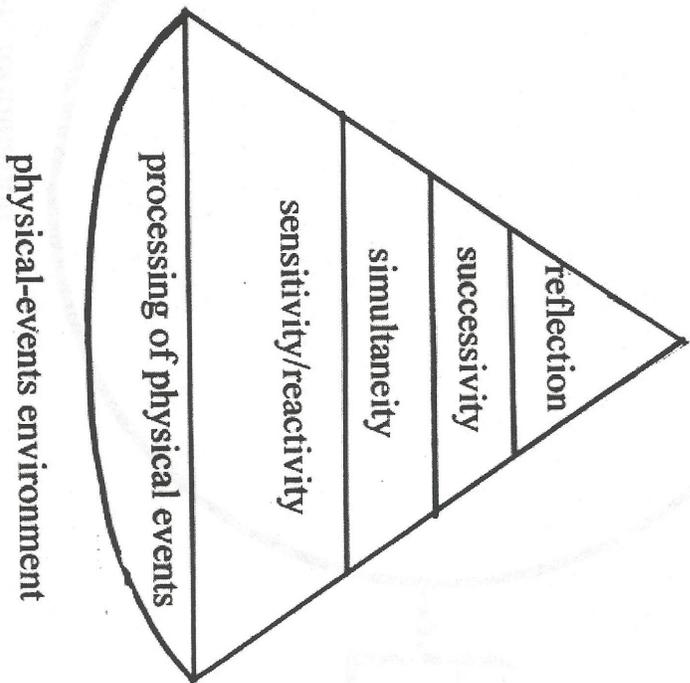


Figure 5 - Hierarchical processing of physiological events

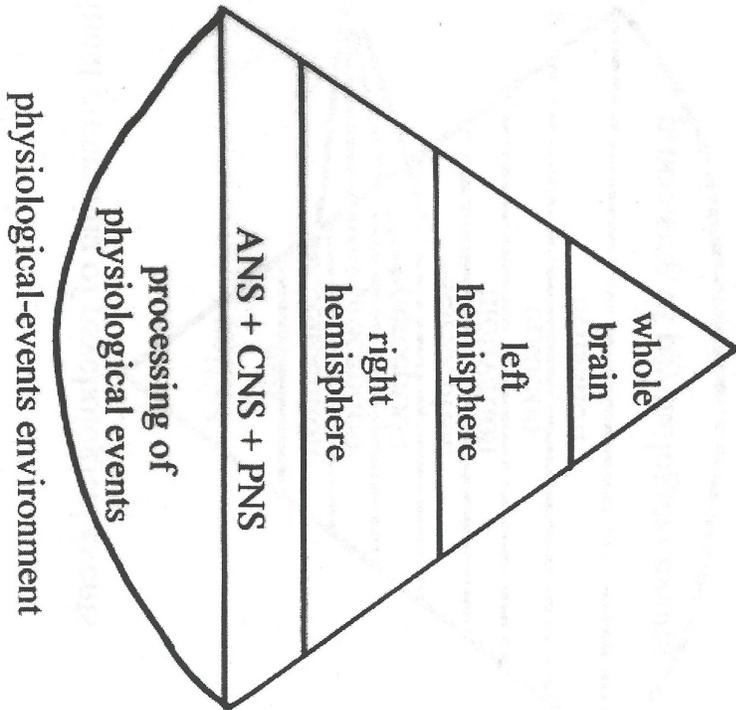


Figure 6 - Hierarchical processing of psychological events

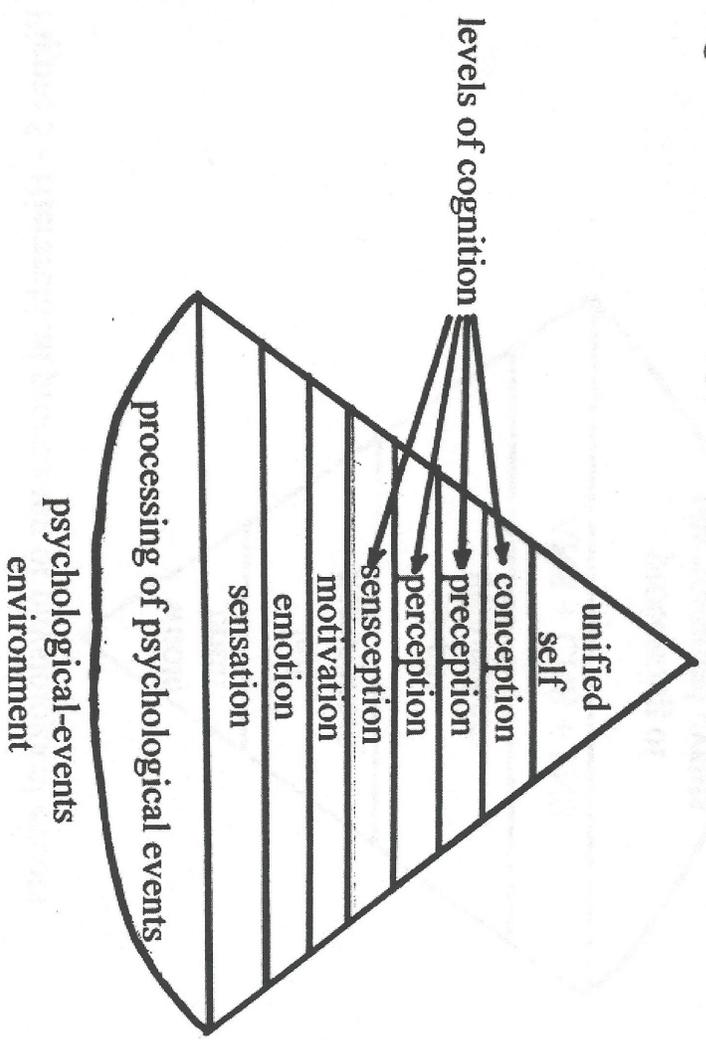
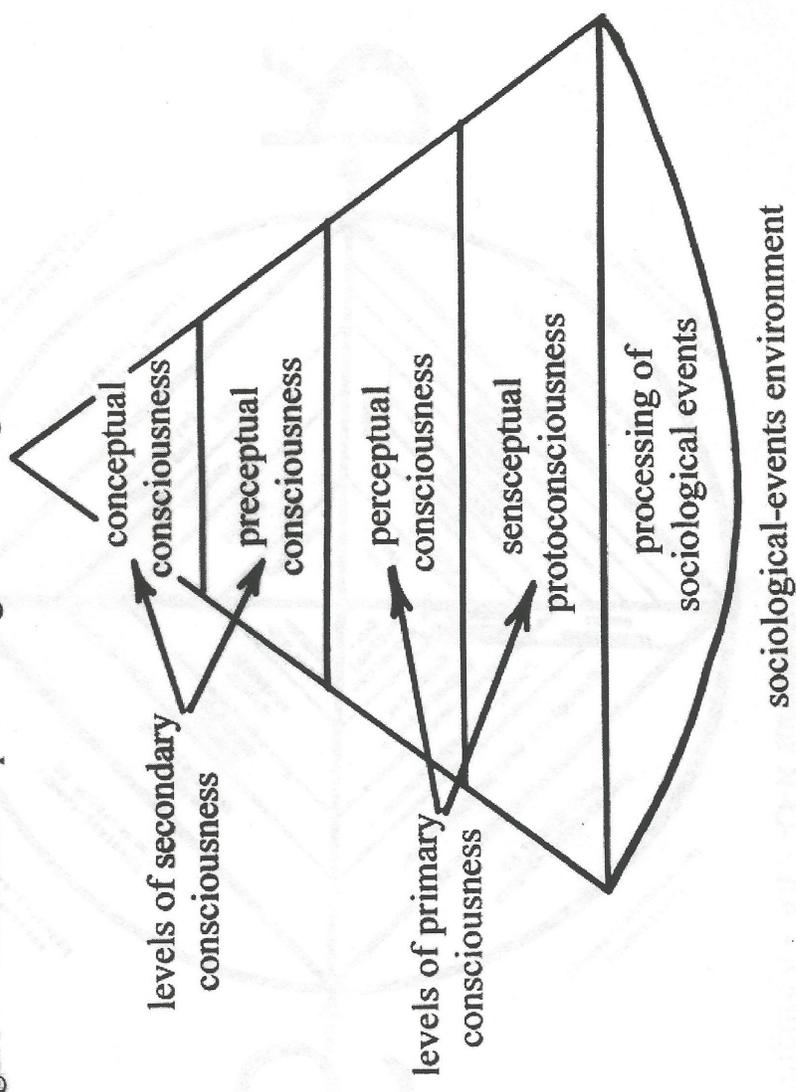


Figure 7 - Hierarchical processing of sociological events



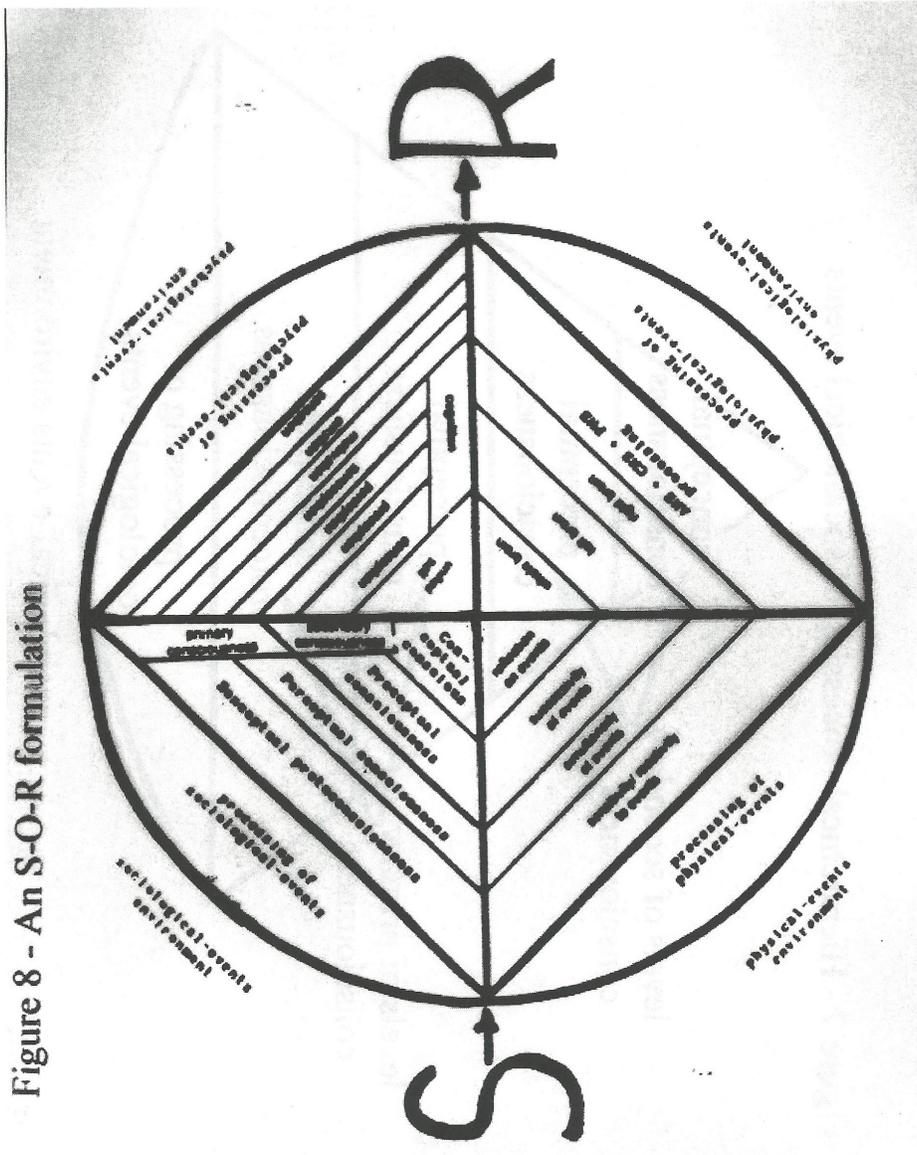


Figure 8 - An S-O-R formulation