

Consciousness Alteration as a Problem-Solving Device: The Psychedelic Pathway

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Abstract

In "normal" states of consciousness, an individual is able to perceive, interpret, and react to events occurring in the "real" world. As experience accrues, a person constructs a "personal universe" to explain the "general universe" and provide a framework for activity. The idiosyncratic nature of this framework, however, means that the personal universe will always be inadequate for explaining the general universe. The conflicts between the various behaviors and attitudes expected of a person as a member of a group will also produce tensions within the personal universe. In "altered" states of consciousness, the cognitive models which make up the personal universe may be stripped of the possibility of verification, and the affective charges attached to these models can be loosened. In such states, the components of the personal universe become more tractable to an innate process which can reduce the tension within the personal universe and the discrepancies between it and the world. Thus, altering consciousness can be a constructive activity. In contrast to other methods of voluntarily inducing alterations in consciousness, psychedelic substances are capable of rapidly producing "desemanticized" states; when used in an appropriate manner, they thus represent powerful tools for restoring individual and group equilibrium.

0. Introduction

The near global universality of methods for inducing altered states of consciousness (BOURGUIGNON 1973:9ff) indicates that some profound aspect of what it means to be human is addressed by such states. Indeed, WEIL (1972) has argued that the human urge to alter consciousness is as innate and powerful as the drive for food or sex (cf. also SIEGEL 1989). If this is true, then we could expect such a drive to fulfill an adaptive function as important as eating or reproduction. In this paper, I will consider this ubiquitous feature of culture as it relates to a deep-seated aspect of the human condition: the need to adapt to an ever-changing world. I will argue that consciousness alteration can help to uncover and resolve discrepancies between an individual's perception of the world and the world itself. In this sense, consciousness alteration can be seen as a problem-solving device.

Among all the methods available for altering human consciousness, perhaps the most radical are those substances commonly referred to as "hallucinogens" or "psychedelics". The rapidity of onset and the nature of their effects—and their lack of toxicity—predispose these compounds for human use (in fact, the abilities of one of these substances, LSD, to break down established patterns of thinking, feeling, and behaving are so great that it has been explicitly characterized as "the problem-solving psychedelic ; STAFFORD & GOLIGHTLY 1967). In order to more fully understand why psychedelics can be of such profound constructive importance, however, it is first necessary to consider the context within which they elicit their effects. As we shall see, these substances are significant because they somehow affect the "normal" functions of the brain and/or its associated nervous system. This in turn leads to drastic changes in the ways in which the world—both the world within and the world without—is perceived, evaluated, and responded to.

Thus, I shall begin with a discussion of some fundamental questions having to do with the role which the brain plays with respect to the world around it. This will lead to a consideration of the nature of the relationship between the mind and the brain, an operational definition of which makes it possible to approach the process of consciousness alteration and to understand how psychedelic compounds affect consciousness. This in turn permits some general principles to be advanced as to why consciousness alteration—including but not limited to that produced by psychedelic substances—can be seen as a problem-solving device.

My intention is to point a way towards a more all-inclusive view of consciousness alteration in general and psychedelics in particular. While the model presented herein necessarily represents a simplified view, it does suggest possibilities for superseding and integrating the dramatic—but nevertheless provincial—insights offered by neurophysiology, psychiatry, evolutionary biology, and ethnology alone. It is a tenet of anthropology, the holistic study of human beings, that activities which exhibit cross-cultural commonalities may reflect "precultural", i.e., biological or "hard-wired" features of our species. Such features are often referred to as "human universals" (cf. BROWN 1991). Human biological universals, however, are manifested through idiosyncratic cultural institutions (MALINOWSKI 1944:91ff)

Thus, the extensive and cosmopolitan use of psychedelic substances (DOBKIN DE RIOS 1990; FURST 1990) should indeed be symptomatic of some fundamental human needs. As a result, any cross-cultural similarities in the manners in which psychedelic substances are used and in the effects they elicit may be expected to point not only to intraspecific similarities in the biological substrates they are affecting (especially the brain), but also to certain intrinsic suprabiological (i.e., psychological, social, and/or religio-philosophical) human needs.

A number of reasons have been advanced to explain why humans use psychoactive compounds. WEIL (1972:17-38) surveyed a variety of methods for inducing altered states and concluded that periodically escaping from "ordinary, ego-centered consciousness" may help the individual in his or her psychic development. SIEGEL (1989:310ff) described many drug users' activities as self-medication, and argued that psychoactive drugs can be considered "adaptogens when they are used to help a person adjust to the psychological or physical changes which they experience. More recently, BLATTER (1993) has delineated seven functions of drug use, including hedonistic/recreational, identity-building and group-cohesive, compensational, medical, religious, economic, and political functions. The function that is being discussed in the present paper—consciousness alteration as a problem-solving device—is one which accords with WEIL'S and SIEGEL'S views and cross-cuts several of BLATTER's functions, in particular the identity-building/group-cohesive, the medical, and the religious. The end effect of this process can be characterized as "re-creational (cf. STAFFORD 1985) because it can serve to reduce the discrepancies between an individual's interpretation of the world and the world itself.

1. The Role of the Brain in Reality Construction

One need shared by humans and all other animals is to construct a reality within which to live. To understand this, it is useful to think of animals as "predatory behavior machines" (PANTIN 1968:156). Regardless of whether it derives its sustenance from plants or from other animals, every animal must interact with the world. If, for example, one animal detects another animal in its proximity, then it must make assessments about that other animal: Could I eat it? Could it eat me? Could I mate with it? Might it take potential mates away from me? and so on. It must also estimate the distance to the other animal, and it must, based upon such assessments, determine a course of action for itself. Should it move towards the other animal, or move away? Or is the other animal irrelevant?

Clearly, the outcome of this process can mean the difference between life and death. But the information that any animal has available for making such assessments is limited, and the abilities of an animal to determine a course of action for itself are thus limited as well.

To a neurophysiologist, the simplest type of interaction that an animal can have with the environment is the reflex. Here, a signal traveling along a sensory (afferent) neuron evokes a signal response in a postsynaptic motor (efferent) neuron, resulting in a muscular and/or endocrine response to the environment. Reflex responses to the environment are wired into every animal, and serve to control the "automatic" processes of that animal. Yet while certain functions of some organisms are indeed regulated by such simple two neuron systems, higher animals—including humans—possess an intermediate network (NAUTA & FEIRTAG 1979) consisting of additional neurons located both physically and operationally between the afferent fibers that bring in sensory data and the efferent fibers that carry out motor responses. Some of these neurons regulate internal bodily processes, e.g., the pulse rate, the processes of digestion and elimination, and breathing (see, e.g., COLERIDGE & COLERIDGE 1991).

As mentioned above, however, many of an animal's activities have to do with things taking place outside its body, events which may have a greater or lesser significance for that animal. Thus, another important function of the intermediate network is to process data relating to events occurring in the external world. In turn, the outcomes yielded by this processing can lead to changes in the automatic internal functions of the body. For example, it has long been recognized that the perception of danger can lead to an increase in the heart rate, changes in the peristaltic activity of the digestive organs, and the excretion of specific endogenously produced substances—all of which serve to prepare the individual to react to that danger (CANNON 1914).

In humans (as in other animals), the brain—the most complex component of the intermediate network—contains no sensory neurons. As a consequence, it receives no sensory information about its own functioning. In a very real sense, then, it stands apart from and between the internal environment of the body and the external environment that is the world, and its essential task is to 'integrate (SHERRINGTON 1947) the two.

Current estimates suggest that the human brain contains some one trillion cells. Of these cells, the vast majority provide structural and material support to the one hundred billion or so neurons that are actually involved in information transmission and processing (FISCHBACH 1992:51). Clearly, the intermediate network of humans is a formidable device. This notwithstanding, the task of the human brain with respect to the world around it is ultimately no different than the tasks faced by an ant, or an antelope, or a lion: to enable the organism to function within a universe that it will never be able to truly comprehend. As Vernon Mountcastle has so succinctly noted, the reason behind this is as profound as it is inescapable:

Each of us lives within the universe—the prison—of his own brain. Projecting from it are millions of fragile sensory nerve fibers, in groups uniquely adapted to sample the energetic states of the world around us: heat, light, force and chemical composition. *That is all we ever know of it directly; all else is logical inference* (MOUNTCASTLE 1975:131; emphasis MOUNTCASTLE's).

It is this process of inferring what is going on in the world outside the brain that I shall refer to here as "reality construction" (cf. BERGER & LUCKMANN 1967)

Reality construction takes place when the neurons of the intermediate network develop an interpretation of—or more precisely, a hypothesis about—the sensory information coming in from the interoceptors (which provide information about the internal environment of the body) and the exteroceptors (which provide information about the world outside the body).

The information being provided to the brain, however, is of only limited utility for this task, for it has already undergone some processing since it left the receptor sites. In humans, all sensory neurons synapse with other neurons before they ever reach the brain, and the information they are carrying tends to be bundled, filtered, and converted every time this occurs (cf. HUBEL 1988). In this way, the vast amount of information which the senses are picking up at any one moment can be checked for its relevance and reduced to a manageable mass. Depending upon the nature and the significance of the information, an affective charge may be also attached to this interpretation before it is consigned to a subdomain of the brain known as memory.

It is inevitable that information will be lost in this process, and one criterion which the intermediate network uses to determine whether afferent data will be shunted along to the next processing level concerns the relative significance of that data. For example, the signals originating in the pressure-sensitive receptors of your buttocks is usually screened out of awareness once you have sat down. Similarly, the sensations from the clothes on your body tend to diminish as the day goes on—unless you sense that you are too warm or too cold, or that your trousers are too tight.

To compensate for the fact that the intermediate network's ability to process information is much less than the amount of potentially available information, all levels of the nervous system are designed to habituate to repetitive information, i.e., signals coming in from individual afferent neurons tend to be filtered out by subsequent neurons if the information they are conveying is redundant for too long a period (EVANS & PIGGINS 1963). One upshot of this is

that new information which is recognized as having a similarity to previously encountered information will tend to be processed more quickly than non-recognizable information (especially if that information has been highly relevant in the individual's recent past; see ATEMA & DERBY 1981; FREEMAN 1981). The counterpart to the tendency to habituate is that the nervous system is sensitive to novelties—to changes in the status quo.

A short example should suffice to illustrate this point. Learning to drive a car is a process fraught with anticipation and oftentimes not a little trepidation. At first, a car may seem like a large, untamable beast. The student driver is acutely aware of everything he or she does, and the tasks of steering, coordinating the gas and brake pedals, and watching out for all those other vehicles occupies most if not all of a person's attention. But things change with experience, and sooner or later it becomes possible to even carry on a conversation while driving. Yet whenever new tasks are introduced (such as learning to use a manual transmission, or to drive in the snow), attention will (usually) once again be more closely focused on the task at hand. Ultimately, however, the task of driving becomes as habitual as such previously learned tasks as walking, riding a bicycle, or swimming, and it is then possible to drive for hours without ever really needing to pay any great attention to the process. Instead, a driver can eagerly anticipate the destination, muse over some past event, or simply enjoy the day. Under normal circumstances, the task of driving only becomes immediate once more when another novelty arises such as having to drive on the other side of the road than one is used to.

But even when our now experienced driver is happily daydreaming as she plows her way through the freeways of Los Angeles, she will (hopefully) still take notice when she sees that a large, dark shape is suddenly looming up from the right. Has that truck suddenly decided to change lanes? Now, all daydreaming is put on hold until the situation can be assessed and a response carried out.

It is not difficult to comprehend why the ability to readily shift attention from one set of data to another and to quickly provide an assessment of the new data would have conferred great selective advantage upon any organism able to do so. But the need to evaluate a situation as quickly as possible also means that the brain will often be called upon to provide an interpretation before it has detailed information about an event, and the more urgent the need to come up with a hypothesis about the world, the more likely it is that only a minimum of information will be evaluated before a model is generated. For example, our driver does not need to know whether the truck is being driven by a man or a woman (although knowledge of this fact would be useful in selecting an epithet for the truck driver), or what state the truck is registered in, or what the truck contains. All she needs to know is that a truck is pulling over, and this information, together with information about the relative positions and speeds of the other vehicles on the road, should suffice to allow her to decide how to avoid an accident.

Hypotheses, of course, can be wrong, and not every interpretation which the brain comes up with will be "correct". Stopping at night at a roadside cafe, our driver might, for example, recognize a rope lying by the side of the road as a snake if her glance is too quick, the lighting too poor, or she has an inordinate fear of snakes (cf. KILPATRICK 1957). Only by continued (sensory) observation and/or (motor) manipulation of the object in question would she be able to check the validity of her initial interpretation.

These examples illustrate two important points: 1) hypotheses (mental models) must be checked by comparing the predictions they generate against subsequent afferent data related to those predictions, and 2) affective charges vary between models. Some models carry a greater affective charge than others, so that these may occasionally "force themselves around" certain sensory data. These two points will be taken up again below.

Reality construction, then, can be conceived of as a process of generating and subsequently testing hypotheses concerning the meaning of sets of sensory information. Once data has been assigned a meaning—a hypothesis has been generated—a response can take place. Our driver's truck does not need to be appreciated in all its "truckness", it must merely be interpreted as a moving object of a particular size and a response must be generated on this basis. Thus, while any internalized model of reality is an abstraction, it is a significant abstraction: "In everyday life the practical acceptance and unconscious interpretation of sense impressions is for all of us our essential link with a realm recognized as external" (HINSHELWOOD 1961:6). In summary, the exigencies of living in the world mean that every "predatory behavior machine" must continually make assumptions about the meaning of the sensory data it is being

provided with, assumptions which will allow it to actively approach the world around it. This process, known as cognition, has been characterized as

"a structuring activity in which the organism seeks to establish a relatively stable pattern in which to act"(FEARING 1954:62).

As FEARING points out, this occurs as the organism imposes from *within* patterns on the world that is *without*. In doing so, it constructs a reality which enables it to carry out the business of its life. At the same time, this idiosyncratically constructed reality—its personal universe—will invariably provide an inadequate model of the world—the general universe.

2. The Mind and Its Relationship To the Brain

Homo sapiens' enormous abilities to construct realities appear to be a result of substantial increases in certain brain areas relative to other mammals, including the *Pongidae* (unpublished data of STEPHAN et al. 1988, cited in ECCLES 1989:146). These same increases may also be responsible for a further human design feature: the mind.[\[2\]](#)

Many contemporary neuroscientists (e.g., BUNGE 1977; MACKAY 1982; SPERRY 1980; SZENTÁGOTHAÍ 1982; and especially ECCLES 1970; cf. also POPPER & ECCLES 1977) view the mind as a higher-level property of the brain which "emerges"[\[3\]](#) when brains attain a certain—as yet non- understood—level of complexity. This higher-level property appears to be associated at least in part with the prefrontal cortex (ECCLES 1989:229ff), and hence with associational and cognitive functions. This would suggest that at least part of the mind's function is also related to reality construction, a notion that has been echoed by some students of the mind. In the simplistic model of SHALLICE (1972), for example, the mind functions to weigh priorities and then select an "action system" which defines its current goals. At the same time, the mind also stores information pertaining to the reasons behind its selection of that particular action system.

An organism that is able to commit to memory the interpretations it makes of sensory data as well as a knowledge of the effects of the motor responses it selected in response to that data *and* which can later recall these various action systems will clearly enjoy a tremendous advantage over organisms that rely more heavily on "instinctual" responses to the world. While it has long been recognized that insects (FRISCH 1965) and even paramecia (FRENCH 1940) are capable of developing responses to the environment based upon events they have personally experienced, the birds and the mammals exhibit an extraordinary ability to learn, an ability which is mirrored especially in the mammals' success *vis-a-vis* the other animals. Animals which can learn from their conspecifics, moreover, either by watching or by being told, enjoy an even greater advantage because they can share their acquired models of reality, i.e., they have *culture* (cf. BONNER 1980:9). Among other things, being a cultural animal means that mental models for interpreting sets of sensory data can be learned in anticipation of the first occasion on which that data is encountered. This ability is of central importance in understanding the human use of psychedelic substances.

As discussed above, those functions of the brain which (at least in the case of humans) were presumably subjected to the greatest selective pressures concern its abilities to develop models of the world which it then arbitrarily imposes upon the world. Because mind is a property which appears to be associated with neo-cortical activity, it seems likely that it is also intimately involved in the process of reality construction. But I would suggest that the mind plays a higher-level role in this activity, for it is able to compare global representations of incoming sensory data to at least some of the learned models stored in the brain and, when necessary, to willfully initiate steps to obtain more information to find, learn, or develop a hypothesis to explain that sensory data.

We may, then, conceive of mind as an *active* agent which serves to increase the organism's ability to respond to the world. In the words of HARRY JERISON (1985:10):

"mind in man and other animals is a consequence of the enormous processing capacity of the brain and is part of the solution of the problem of putting that capacity to work".

The mind evaluates those products of the brain that are made available to it and compares these against previously constructed models that are stored as memories in the brain. When there are no models available, the mind can make an active effort to construct them. This view implies that somewhere within the brain, certain products of brain processing are made available to this higher-level system or, stated from a different perspective, the mind gains awareness of these, and it then becomes able to affect these, to supervene in these, and thus to initiate activity.

ECCLES (1982), borrowing a term from SHERRINGTON, has referred to that portion of the brain which is accessible to the mind, and upon which the mind can act, as the "liaison brain". As he noted, not all of the brain's products are available to the mind, and the mind must continually scan those products it is being provided to determine which of them should be given its (limited) attention.

This manner of considering the relationship between brain and mind is known as "Interactionism". [4] Although there are various alternative formulations of the Interactionist view (compare, e.g., POPPER & ECCLES 1977 to SPERRY 1980), they agree on the essential statement that certain brain products are made available to a higher-order property—the mind—and that the mind can in turn exert an influence upon at least some functions of the brain. In this view, just as the physicochemical processes of the cells are the prerequisite for the phenomenon called "life", brain processes are the prerequisite for mind.

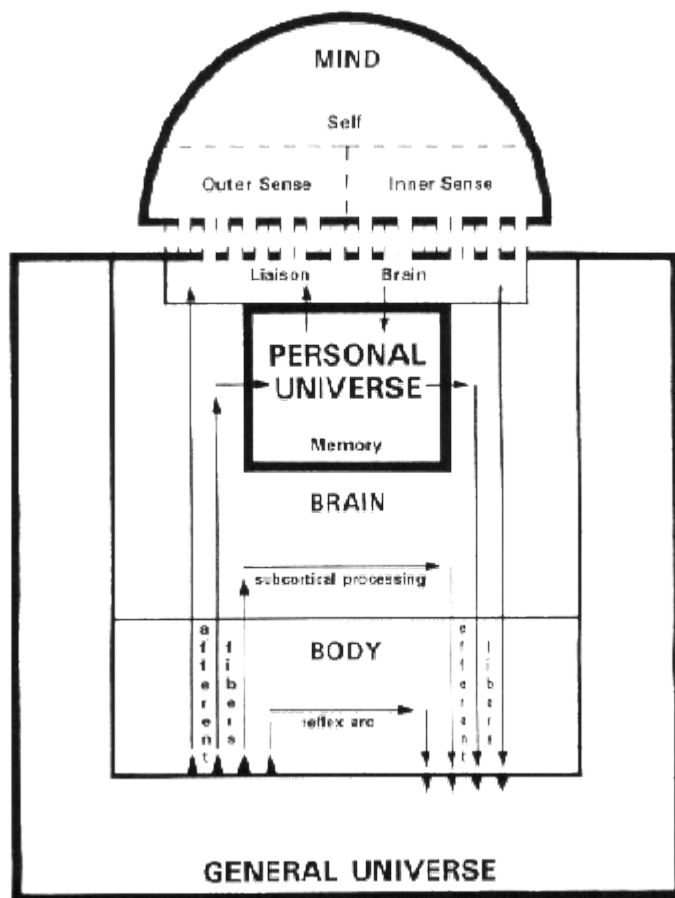


Figure 1: Information flow diagram illustrating the levels at which afferent (sensory) data is processed and efferent (motor) responses are initiated. The mind can only become "aware" of information via the liaison brain. The personal universe, the idiosyncratic interpretation of the general universe which the individual has constructed during his lifetime, is stored in memory. See text for further explanation (adapted from ECCLES 1970:167). From an evolutionary perspective, the individual's need to survive and reproduce—both outward-directed activities—has priority over all of its other behaviors, for only in this way will its genes be passed on to the next generation. Thus, it seems likely that the type of brain-mind relationship that has had primacy during the course of evolution is a condition in which the mind is being provided with "adequate" information about external events, is able to "correctly" evaluate this information, can decide upon "realistic" responses to those events, and can use subsequent information to modify or change previously developed models.

Figure 1 summarizes the discussion thus far by illustrating some of the ways that incoming sensory information can be processed and motor responses initiated. The simplest, as we have seen, is the reflex arc, an essentially "hard-wired" pathway permitting only very limited subsequent modification. Above this level are processing loops regulating behaviors that have been learned during the course of the individual's life. These include such activities as walking, driving, swimming, playing a musical instrument, etc. While it may have been necessary to pay a great deal of attention to these activities as they were being learned, once adequate models of these (motor and cognitive) processes are developed and stored in memory, then the activities are carried out more or less automatically. The effects of motor learning are regulated by sub-cortical (including cerebellar) mechanisms, while cognitive models entail cortical processing. But none of them, once learned, require the active participation of the mind, which stands apart from both the products of cognition and their affective charges. [5]

Following ECCLES (1970:167), the mind is shown as consisting of three distinct components. "Outer Sense" is concerned with the outward-directed products of perception, while "Inner Sense" is an aspect of mind which monitors the internal status of the body by considering emotional signals, checking memories, recalling plans, etc. A useful way of distinguishing between "Outer Sense" and "Inner Sense" is that the information being provided to the former is subject to consensual validation, while the information being made available to the latter is not. The third aspect of mind is the "Self", which ECCLES (1982a:66) has referred to as "the basis of our unity as an experiencing being throughout our whole lifetime".

The personal universe—the idiosyncratic interpretation of the world—is located within the memory of the individual. In turn, the individual is located within a greater reality, the general universe. The distinctive position of the mind relative to the brain in this figure is intended for heuristic purposes and has no ontological implications. In this static representation, the dynamic relationship between the liaison brain and the mind is indicated by the fact that not all of the possible channels between the two are open. This is intended to illustrate that not all of the products of the liaison brain are made available to the mind at any one moment, and that the mind is continually scanning the liaison brain for information that it considers relevant.

Based upon this conception of the roles of and relationships between the mind and the brain, I propose the following axiomatic definitions: "consciousness" is an active principle of a mind that is interacting with a brain. [6] "Unconsciousness", then, is a condition in which no such interaction is taking place. "Awareness" is defined as that threshold at which the mind is provided with information about brain products. Furthermore, since everyday experience demonstrates that the mind is only able to focus on a small amount of the material it is being provided with at any one moment (i.e., the mind works in a serial fashion), we may define the term "attention" to refer to the mind's disposition to actively select and focus on a subset of those brain products which reach awareness.

While this view of consciousness may appear unusual, it is a heuristically valuable way of cutting through the Gordian knot of the "ultimate solipsism" of science (DOTY 1975:791). There is no shortage of definitions of consciousness (a fact which has been lamented for decades; cf. PERRY 1904:282), and it could be argued that there is no need for another. Yet as DAVID OAKLEY (1985:xii) has recently stated, "progress in theories of consciousness will be slow until a conceptual framework which at least diminishes the semantic confusions is adopted". The definitions proposed above represent an attempt to answer this, while the dynamic view of the relationship between brain and mind which is being outlined here opens the door for a clearer understanding of the ways in which their interaction can be affected. The position being argued in this paper is that psychedelic substances are such powerful problem-solving devices precisely because they alter the mind-brain interaction in such a manner that the mind may no longer be able to actively intervene in brain events, effectively rendering it a spectator of the information which the brain is providing it.

3. "Normal" and "Altered" States of Consciousness

The theses that one of the brain's primary functions is reality construction and that the mind is an emergent property of the brain involved at least in part in the same task leads to the question of what is the "normal" nature of the relationship between the two. Evolutionary considerations suggest an answer to this question.

Reality construction is essentially an outward-directed process, i.e., it is primarily involved with developing hypotheses about the meaning of the data being fed to the brain by afferent fibers originating in the exteroceptors. To be sure, from time to time unusual or relevant data (such as pain signals) from the interoceptors will attract the attention of the mind, but most of the data the mind is made aware of concerns the world which begins at the outer surface of the skin. This is not surprising, for, as we have seen, an animal must continually monitor the world around it, make hypotheses about what it is experiencing, and check on the "correctness" of these hypotheses.

Following TART (1980), we may refer to this normal pattern of brain-mind functioning as the "baseline" state of consciousness. In humans, one of the chief attributes of this state—and one of the characteristics which distinguishes it from other states of consciousness—is that it is built upon consensus. In the words of BERGER & LUCKMANN (1967:23):

The reality of everyday life... [is] an intersubjective world, a world that I share with others. This intersubjectivity sharply differentiates everyday life from other realities.... I am alone in the world of my dreams, but I know that the world of everyday life is as real to others as it is to myself. Indeed, I cannot exist in everyday life without continually interacting and communicating with others.

Personal experience tells us that the dream state differs starkly from the baseline state. While dreaming, the dreamer perceives himself to be actively engaged in a myriad of activities, yet an outside observer watching the dreamer will typically remark that little if any corresponding physical activity is occurring.^[7] Clearly, the active principle that is consciousness is subject to change, and such changes are a natural part of everyday life. What is more, we all know other, less dramatic changes which we undergo as well, such as the drowsiness which sets in after a large meal, the excitation which occurs in conjunction with sexual activity, and the "white line fever" which can occur during protracted periods of long-distance driving. Consciousness is clearly a dynamic event, and it thus seems more accurate to speak of it as a process rather than a state. How then can this process be affected?

In a now classic paper, ARNOLD LUDWIG (1966) suggested that there are five essential means for inducing alterations of consciousness: (1) by reducing exteroceptive stimulation and/or motor activity; (2) by increasing exteroceptive stimulation and/or motor activity and/or emotion; (3) by increasing alertness or mental involvement; (4) by decreasing alertness or relaxing the critical faculties; and (5) by changes in the body chemistry or neurophysiological functioning.

The first four of these pertain to reality construction per se. That is, (1) and (2) refer to shifts in the relative amounts of afferent and efferent data which require processing and to the affective charges associated with that data, while (3) and (4) pertain to the quality of the processing which that data undergoes. In contrast, LUDWIG'S category (5), which includes such procedures as fasting, dehydration, hyperventilation, seizures, and the use of certain drugs, encompasses procedures which alter consciousness by affecting the very physicochemical processes which make it possible.

SILVERMAN (1968), building upon LUDWIG's ideas, suggested a further refinement of the latter's categories (3) and (4). He noted that an individual's "attentional style" can vary with respect to the relative *intensity* of a stimulus, the *extensiveness* of the search which an individual makes of his stimulus environment, and of the *field articulation* of that individual's attention. Similarly, POPE & SINGER (1980) noted that consciousness ranges over a continuum between a public, consensual extreme to a private, non-consensual extreme.

These conceptions of mental activity all recall ECCLES (in POPPER & ECCLES 1977:361-370) view (cf. Figure 1) that the mind serially focuses its more or less limited attention on the products which the brain is making it aware of, products which it obtains through both Outer Sense and Inner Sense. They also emphasize the dynamic nature of the

interaction between the brain and the mind and the active role which both play in reality construction.

Much of the time, the external world offers enough novel information to absorb most of the mind's attention. However, at certain times (such as when not enough novelty is available), the mind may shift its focus to more private domains, including the inner world of fantasies, hopes, momentary concerns, etc.

This distinction between information deriving from the outer world and that originating in the inner world is of great utility in understanding states of consciousness, and corresponds to a dichotomy of outward-directed and inward-directed modes of physiological and psychological operation which differ with respect to the relative roles played by the sympathetic and parasympathetic branches of the central nervous system in each. This dichotomy was first demonstrated in a series of experiments in which electrodes were implanted into the midbrains of cats so that the effects of electrical stimulation of small groups of cells could be observed. Stimulation of some areas caused previously awake cats to curl up and go to sleep (HESS 1949), whereas stimulation of other areas elicited defensive reactions, including growling, hissing, and piloerection (HESS & BRUGGER 1943). While such defensive reactions are normal when exhibited in the presence of an exogenous stimulus (such as a dog), it was found that provoking these responses endogenously by electrical stimulation led the animals to direct them towards their handlers or towards other persons that were present, in spite of the fact that these had done nothing to overtly provoke the response.

Their work led HESS & BRUGGER (1943) to suggest that the sensory and motor fibers responsible for the elicitation and evaluation of such responses are linked within the midbrain, which in turn is connected to higher-level cortical structures. While cortical assessments of incoming afferent data normally elicit subcortically mediated responses, in this case artificial subcortical stimulation was subsequently assigned a cortical interpretation, primarily via visual sensory data. This illustrated the interrelationship between the two levels, whereby the cortical level is responsible for assessing events in the external world and the subcortical level for carrying out the responses selected on the basis of these assessments.

As a result of these findings, HESS (1949) proposed a distinction between "ergotropic" and "trophotropic" responses. Ergotropic responses are activated by sensory information pertaining to events occurring in the outer world and information coming in from endogenous afferent fibers (interoceptors). Typical ergotropic responses include hypertension, pupillodilation, an increase in respiratory activity, etc., i.e., sympathetic arousal. The trophotropic response is manifested as a general decrease in the organism's ability to perform physical activity or otherwise encounter the outer world, and is characterized by such typical parasympathetic responses as pupilloconstriction, hypotension, a drop in respiratory activity, etc. The trophotropic response serves to protect the organism against overexertion and helps facilitate restorative processes.

The dichotomy between these two general types of physiological functioning led DEIKMAN (1971) to distinguish between an "active mode" and a "passive mode" of consciousness. In the active mode, an individual is able to manipulate the environment, both literally and with respect to reality construction (in DEIKMAN'S view, language is "the very essence of the action mode" [1971:482]). The active mode is directed towards the external world, and its most essential function is to ensure immediate biological survival. In contrast, during the passive mode the individual primarily "intakes" the environment with respect to both stimuli and nutrients. While this mode dominates during infancy, its importance diminishes as the child learns to act within—and upon—its world. But the passive mode does not disappear as the active mode is developed; instead, it becomes the latter's complement with respect to both the physical (e.g., through sleep) and psychological (e.g., in insight learning) domains.

ROLAND FISCHER (1971, 1975, 1976), building upon the dichotomy, proposed viewing consciousness states along a continuum whose center is the baseline state. States of consciousness which are primarily trophotropic are located along the "perception-meditation" arm of the continuum, while states of consciousness characterized by ergotropic stimulation are located along the "perception-hallucination" arm. To FISCHER, the baseline state is that condition in which "perception" can take place; i.e., in which an individual is able to deal with events in the external world and continually validate the correctness of his perceptions of the world. According to FISCHER, an individual has essentially two basic ways of verifying its picture of reality: approach and withdrawal. In other words, he must make a motor effort to confirm his perceptions. While this often occurs "automatically" (e.g., through saccadic eye

movements), it can also entail actual physical manipulation of the object in question.

The baseline state is thus characterized by a relatively low sensory to motor (S/M) ratio (FISCHER 1971:898). Changing this ratio conveys one from the realm of consensus reality and the possibility of reality validation, so that a person begins to experience increasingly non-consensual realms. States in which there is a high S/M ratio, i.e., in which there is a great deal of sensory information that cannot be validated by motor activity, are by definition hallucinatory (cf. BACHINI, VILLAR, PRIETO & AUSTT 1965). In contrast, states in which motor activity is at a minimum and sensory input tends towards stereotypy (so that it is increasingly excluded from awareness) lie along the perception-meditation continuum.

Echoing HESS and BRUGGER'S work, FISCHER argued that it is the "cortical interpretation attached to subcortical activity" (1976:5) which gives altered states of consciousness their subjective meaning. As the S/M ratio shifts away from that of the baseline state, the relationship between subcortical activity and cortical interpretation changes as well. In states lying along the perception-meditation continuum, the low level of external and internal arousal essentially means that there is little information to interpret. In contrast, the high S/M ratio characteristic of states along the perception-hallucination continuum implies that the mind may experience increasing difficulty in providing an interpretation for the information being made available to it at least in part because it becomes increasingly difficult to determine whether that information pertains to events occurring in the external world or whether it instead arises from within the body/brain. In such states, "man's ability to verify with his hands and feet an experience as 'real' is gradually inhibited and ultimately blocked" (FISCHER 1975:233). Thus, even when the mind is able to draw upon the models stored in the brain for interpreting the information it is receiving, it will generally be unable to verify whether any particular model actually provides a correct hypothesis for an event, for normal motor responses are not available for validating the model.

When the mind is unable to verify the correctness of its interpretations of sensory data, the affective charges attached to these interpretations can be decoupled. As a result, at least some cognitive models may be seen in a different affective light. Sometimes highly charged material can become manifest when the cognitive models which overlay it are suspended (cf. GROF 1976). At other times, previously mundane mental models may become quite significant: "Accepted, normal, even trivial phenomena, seen under the influence of LSD, frequently assume dramatically increased or important new perspectives: a stack of cups can become a beautiful and meaningful visual experience" (SMITH & ROSE 1967-68:119). Or the mind may begin to survey its models with more or less complete detachment, almost as if they were pictures hanging in a gallery:

When the level of arousal—sympathetic (ergotropic) excitation—is raised, either naturally, or through the administration of psychoactive drugs of the LSD, psilocybin, mescaline, ketamine, or PCP-type, *everything* experienced becomes equally meaningful. A grain of sand is as meaningful as anything else in the Universe (FISCHER 1992:7).

This decoupling of cognitive models from their normal affective charges is of central importance for understanding the constructive potential of consciousness alteration and will be discussed in more detail below.

While as LUDWIG (1966) noted, there are a variety of ways to dislodge oneself from the baseline state, in the present context we are primarily concerned with a set of methods subsumed under his category (5): "Changes in the body chemistry or neurophysiological functioning". Common to many of these methods is the fact that they are induced by a special type of exogenous agent often referred to as an "hallucinogen". [\[8\]](#) The experiences such substances produce are characterized in part by the presence of a great deal of sensory information which cannot be validated via motor activity. Under such conditions, the mind can often do little more than observe the brain products which reach its awareness.

4. The Desemanticizing Action of Psychedelic Substances

While the major psychedelic agents vary somewhat with respect to their chemical structures and effects, all are structurally similar to the neurotransmitters serotonin, norepinephrine, and dopamine. Although this fact suggests promising avenues of investigation, we are still a long way from understanding precisely how these compounds affect neurotransmission at these receptor sites (SNYDER 1986:195-196). Lacking an adequate biochemical model, many researchers have preferred to study hallucinogenic compounds as well as other drugs by investigating their phenomenological effects.

In contrast to other psychoactive substances, however, the effects of hallucinogenic substances are extremely difficult to discern without human subjects. Because animals are unable to provide subjective reports, research protocols of animal experiments have tended to focus on changes in behavior. For example, under the influence of LSD, fish were observed to swim in strange ways, mice to exhibit disturbances in their licking behavior, and cats to exhibit increased piloerection and salivation (HOFMANN 1982:37-43). One high school student who injected spiders with LSD found that they "wove erratic webs and showed psychotic behavior similar to schizophrenia" (reported in *Chemistry* 1968). While these striking outwardly visible effects suggest similarly dramatic internal effects, there is no way to precisely delineate these. Only human experimentation can provide this information.

The key role which the human subject plays in such work is underscored by ALBERT HOFMANN'S attempts to isolate the active principle(s) of *Psilocybe mexicana*, the *teonanacatl* ("flesh of the gods") of Aztec Mexico. HOFMANN, who was enlisted for this project after workers in other laboratories were unable to discover which substances in the mushrooms were provoking the profound effects, quickly realized that the insight he had gained during his previous work with LSD applied to this task as well, namely, that animal testing of the various plant extracts which he prepared could be of only limited utility, and that proper testing must involve humans. As a result, he (and several of his colleagues) carried out this potentially risky task themselves, eventually isolating the indole alkaloids psilocybin and psilocin (HOFMANN 1982:128-131).

The necessity to consider subjective reports when attempting to understand the effects of *any* psychoactive compound is reflected in the choice of terms which have been used to describe such substances. For example, Louis LEWIN, one of the first researchers of the modern era to offer a systematic classification of psychoactive agents, suggested that there were five basic types of "betaubenden und erregenden Genussmittel" ("sedative and stimulating drugs"; LEWIN 1981 [1927]:47-48): "Euphorica" (e.g., opium and its derivatives, cocaine); "Inebriantia" (e.g., alcohol, chloroform, ether); "Hypnotica" (e.g., chloral hydrate, kava); "Exzitantia" (e.g., tobacco, betel, and caffeine-containing substances); and the "Phantastica" (e.g., peyote, hemp, fly agaric, and certain of the *Solanaceae*).

ALBERT HOFMANN (in SCHULTES & HOFMANN 1980:13) revised LEWIN'S schemata slightly, distinguishing between "Analgetica and Euphorica" (including opium and cocaine), "Sedatives" (reserpine), "Hypnotica" (kava kava), and "Hallucinogens or Psychotomimetica" (peyote, marijuana, etc.). The more recent classification of ALEXANDER SHULGIN (1992) differentiates between "Stimulants" (e.g., coca, coffee, betel nut, tobacco), "Intoxicants" (e.g., alcohol, ether, chloroform, N2O, barbiturates), "Depressants" (e.g., opium and its derivatives, chlorpromazine, meperidine), "Delirians" (e.g., certain solanaceous plants, ketamine, ibogaine, PCP), "Entactogens" (MDMA), and "Hallucinogens" (e.g., peyote, *Cannabis*, *teonanacatl*, LSD, DMT).

While these schemata differ in the manners in which they relate, e.g., tobacco, alcohol, or cocaine, all three recognize that "hallucinogenic" substances (LEWIN'S "phantastica"[\[9\]](#)) constitute a unique group profoundly different from other drugs. One word often used to describe these substances, "psychedelic" ("mind manifesting"), was coined by HUMPHRY OSMOND (1964 [1957]:148) in response to another term that was in common usage during the 1950s: "psychotomimetic" (referring to the apparent abilities of these substances to mimic certain types of mental illness).

The possibility that LSD[\[10\]](#) could elicit psychotic states was suggested in one of the earliest articles to discuss the drug. There, WERNER STOLL (1947:315) described LSD as a "Spurenstoff, der akuten Psychosen von exogenen Reaktionstyp erzeugt" (a "trace substance which produces acute psychoses of an exogenous reaction type"). After LSD became generally available to the therapeutic community, the "model psychosis" paradigm led many health care workers and other professionals interested in the human psyche to take these drugs in order to gain insight into the

inner workings of the abnormal mind and also led certain agencies within the United States government to investigate the possible use of such compounds in psychological warfare (a move that would eventually help launch the so-called "psychedelic revolution" of the 1960s; see STAFFORD 1985:221; STEVENS 1987:78-84).

The model psychosis paradigm and other, similar theoretical models were ultimately abandoned as researchers came to realize that drugs such as LSD do not produce uniform effects in every person who uses them. "In fact the effects can be so varied that reading different workers' accounts it is not always apparent that they are studying the same substance" (BENNET 1968:1220). As CHARLES TART noted:

what were considered to be drug-specific effects... have been found to be a mixture of drug *plus* psychological purposes. Indeed, one could argue... that the major psychedelic drugs have *no* specific psychological effects, they simply produce phenomena in accordance with the expectations of [subjects] and experimenters, acting as a sort of psychological "amplifier" (TART 1972:386; emphasis TART'S).

STANISLAV GROF (1976:26-28) analyzed records of over thirty-eight hundred LSD sessions without being able to determine a single specific pharmacological effect of LSD, i.e., a drug-related symptom which appeared every time the drug was administered. Because of this, he attributed the extraordinary assortment of physiological effects he observed to a "chemical activation of psychodynamic matrices in the unconscious" (1976:28). These same psychodynamics can also influence the amount of a psychedelic substance required to elicit the desired effects (1976:22).

The central role which psychological factors play in psychedelic sessions was explicated in the "set" and "setting" model. The importance of set and setting was first pointed out by TIMOTHY LEARY and his colleagues at Harvard. Set refers to the personality of the person ingesting the drug and the expectations for the experience; setting refers to the conditions under and the physical surroundings in which the session takes place (LEARY, METZNER & ALPERT 1964:103-107; for a more detailed formulation with clinical relevance, see DOWNING 1972).

The recognition of the pivotal roles of set and setting helped to clarify many of the findings from the initial period of work with LSD and other related substances. For example, it became apparent that the model psychosis approach had taken on self-fulfilling qualities. The settings of many of these early projects—clinics in which white-frosted scientists administered batteries of psychological tests combined with the hypersuggestibility of many persons while under the influence of psychedelic drugs often provoked psychotic-like episodes (TART 1972; YENSEN 1985:271). The findings of these studies contrasted sharply from those in which more supportive and non-threatening settings were employed (e.g., FREDERKING 1955; ABRAMSON 1976). Set and setting also helped to explain why adverse reactions sometimes occurred when illicit drugs (which not infrequently contain impurities; see CHEEK, NEWELL & JOFFE 1970) were taken under unsupervised conditions (SMITH & ROSE 1967-68; COHEN 1985), by prepsychotic or psychotic individuals, and/or in a general climate of legal repression and paranoia (SMITH & SEYMOUR 1985).

Because the primary effects of psychedelic substances are psychological rather than physiological, and because the psychological effects vary from person to person and session to session, the fundamental effect of LSD (and by extension of the other major psychedelics) has been described as a "temporary suspension of the mechanisms which provide structure and stability to man's perception of self-image, environment, beliefs, and values in the normal state of consciousness" (McGLOTHLIN & ARNOLD 1971:40), i.e., what I have termed the personal universe.

To paraphrase FISCHER (1976:5), we can say that psychedelics produce an acute state in which it is frequently difficult—if not impossible—to provide a cortical interpretation (whether by recalling a previously acquired model or developing a new one) for subcortical activity. Sensory data, in effect, becomes meaning-less. While such "desemantication" (WALLACE 1970:217) can have psychopathological outcomes when an individual is unaware of the mechanisms responsible (COHEN 1985:293) or if it is a chronic occurrence, the enormous popularity of hallucinogenic substances in recent years (STAFFORD 1985) and the widespread use of various hallucinogenic substances in the past (see, e.g., DOBKIN DE RIOS 1977; TORRES et al. 1991) implies that the temporary suspension of meaning—when it occurs under the proper circumstances—can often have positive consequences.

Later models for using LSD as a psychotherapeutic adjuvant explicitly recognized and made constructive use of the desemanticizing effects of psychedelic substances. Several paradigms were developed for such use (see YENSEN 1985 for a detailed discussion). A brief consideration of the two most influential will be useful in the present context.

In Europe, psychotherapists employing hallucinogenic substances developed what became known as the "psycholytic" (from *psyche* + *lysis*, the "loosening" or "dissolution" of the psyche) approach. Its aim was to gradually reveal the tensions and conflicts within a person (cf., e.g., SANDISON, SPENCER & WHITELAW 1954; FREDERKING 1955; ABRAMSON 1976; GROF 1976). Such therapy typically consisted of a series of low to medium doses (< 200 mcg) of LSD.

Workers using the psycholytic approach felt that the understanding and resolution of personal conflicts which it permitted were important factors in the healing process. Eventually, however, a number of researchers in North America began to suggest that for at least some patients, the re-exposure to traumatic past events and the realization of other dynamics responsible for their condition might result in lower self-esteem, guilt, and other negative effects. To circumvent this possibility, they developed a regimen in which a preparatory period of discussions and psychotherapy was followed by a single large dose (between 300 mcg and 600 mcg) of LSD in a deliberate attempt to elicit what can be termed a religio-mystical experience (cf., e.g., SHERWOOD, STOLAROFF & HARMAN 1962; MOGAR 1972 [1965]). This model became known as the "psychedelic" approach to psychotherapy.

The use of LSD and other related substances in therapeutic contexts has provided important evidence supporting the view discussed above that the brain and the mind function to construct a reality within which the individual can act and has pointed to the great role which learned models play in categorizing an individual's sensory impressions and hence organizing behavior and experience. For example, STANISLAV GROF'S extensive clinical work led him to posit the existence of "COEX systems" ("systems of condensed experience") which can have either positive or negative affective charges. According to GROF (1976:64), positively charged COEX systems tend to reflect happy, satisfying experiences of the individual. In contrast, negatively charged COEX systems frequently appear to be linked to episodes which were so traumatic to the individual that the interpretational models based upon such experiences can subsequently "force themselves around" later events, causing a person to exhibit neurotic or psychotic behavior patterns (1976:61-64). The psycholytic approach, which GROF helped to pioneer, was designed to enable the therapist to assist the patient to slowly work through the experiences which had accrued around such interpretational schemata, so that the patient could eventually gain awareness of, relive, and emotionally abreact the original "core" experience. Afterwards, the knowledge of the experience could be reintegrated into the person's personal universe, permitting a more effective evaluation of reality.

In addition to its ability to loosen acquired cognitive structures with strong affective charges, other evidence indicates that LSD can aid a person to construct alternative models for even extremely habituated sets of sensory data. For example, ERIC KAST (reported in the *Journal of the American Medical Association* 1964), who administered LSD to terminal cancer patients, found that the drug was capable of alleviating pain for up to thirteen days (in contrast, traditional methods, including morphine, are only effective for several hours). While many patients reported that they still had pain, they said that it was no longer important. In interpreting his findings, KAST stated that LSD "lessens the need to maintain bodily integrity and produces certain obliterations of the ego boundaries". This made possible a "reintegration of the self-image by exclusion of the painful part" (1964:33).

Drug sessions with the dying have typically been structured according to the psychedelic approach, i.e., the terminal patient ingests a single, high dose of a drug (GROF & HALIFAX 1978; KURLAND 1985). As with other such sessions, the presession preparation is an important factor. GROF (in Avorn 1972:87), for example, noted that patients frequently approach death "with the idea that all you have in life is of a material nature, and that death means an end to everything, losing whatever you have, whatever you are". The drug experiences of many of these patients led to a mitigation of the negative affective charges attached to their conceptions of dying, so that following the drug session, many of the patients were so able to accept their condition that they began to put their affairs in order, to aid family members to discuss and accept the approaching bereavement, and to constructively use the remaining time to settle legal and financial questions.

There is also anecdotal evidence suggesting that learned models can be involuntarily modified during a psychedelic session. In one study in which persons who had previously ingested LSD were asked whether they had changed as a result, one respondent stated that: "I was unprepared to have my world and moral structure broken down and it has taken time and much effort to rebuild" (in McGLOTHLIN & ARNOLD 1971:46). Another subject in the same study noted that LSD had "subverted my Protestant ethic" (in McGLOTHLIN & ARNOLD 1971:42). While infrequent within this sample, such unanticipated outcomes underscore the hazards involved when a person is given an hallucinogenic substance without their knowledge. At the same time, these effects also suggest that the psychedelic experience may provide insight into internal psychological conflicts which a person might not have even been aware of and which they would have rather ignored.

The use of psychedelic drugs to gain insight into personal problems and concerns is also well documented in the ethnographic record. JAMES FERNANDEZ (1982:476485), discussing the ritual use of *iboga* (*Tabernanthe iboga*, a plant whose primary psychoactive alkaloid is ibogaine) among the Fang of Gabon, noted that many of his informants reported that they ingested the drug because of their desire to discern the source of a witch-related affliction, an illness or general malaise they were suffering from, or because they were discontent with the foreign religions being propagated by local missionaries and were seeking insights into their own traditions.

MARLENE DOBKIN DE RIOS (1972), who conducted fieldwork in Peru to document the indigenous use of *ayahuasca*, [11] noted that the brew was used for a variety of purposes, including divination, to communicate with the supernatural world, to cause or protect against witchcraft, to determine the etiology of and/or treatment for a disease, and for hedonistic purposes (1972:45). In her own study of ayahuasca healing sessions, she found that many of her respondents believed that their suffering had been caused by another person. Although she described such afflictions as "psychological" or "psychosomatic", she was very careful to point out that the natives of Peru construct the etiologies of these ailments differently than Westerners, for they ascribe many illnesses to the malevolent actions of others. Thus, illness is not merely an individual responsibility, it is a social event. DOBKIN DE RIOS also found that most individuals who used ayahuasca did so in times of acute personal stress, and their sessions with the potion usually helped to alleviate this. Indeed, when properly prepared and administered, ayahuasca can apparently be so efficacious that even the *gringa* anthropologist reported "feelings of well-being that dodged [sic] my steps for several months after" she participated in an ayahuasca session (1972:128).

As part of a study of the beliefs and rituals associated with the Huichol use of peyote (*Lophophora williamsii*, a cactus whose principle psychoactive component is mescaline), BARBARA MYERHOFF (1974) undertook a peyote hunt to the sacred land of Wirikuta. Listing the reasons why the other participants were going, she noted that several were there to gain insights into various aspects of their personal life or the life of a relative (1974:118-123). As part of the peyote hunt, the participants, known as *hiruritamate* ("peyote companions"), take on new names and eventually attain a state in which they see no distinction between the participants and their guides, between men and women, and between humans and gods:

Ritual status and all other forms of social distinctions are set aside so that for a little while men stand apart from their social roles and culturally provided "personalities". Frightened and elated by this freedom, unknown since the moment of birth which forever fixes one in a social matrix, the *hiruritamate* stand nakedly beside one another, undefined, vulnerable, and starkly human (1974:259).

This state, which MYERHOFF (1974:258) referred to as a "transcendence of paradox and differentiation", allows the *hiruritamate* to resolve the dilemmas of their otherwise marginal existence and to attain a sense of wholeness.

The use of peyote for religio-mystical purposes spread from northern Mexico into the United States during the latter portion of the nineteenth century, and eventually led to the establishment of such peyote-based religions as the Native American Church (STEWART 1987). The ceremonies which have developed around peyote use here incorporate both Christian and native elements and provide a ritual context in which the participants' can journey along the "peyote road" in search of healing, both for physical and spiritual complaints.

This brief discussion of ethnographic and clinical studies shows that psychedelic sessions evoke somewhat different types of material when used in traditional and non-traditional frameworks. In Western settings, where sanctioned use typically occurred in a clinical environment and non-sanctioned use continues to take place under a wide variety of circumstances, psychedelics tend to elicit idiosyncratic material of a psychobiographical nature. In contrast, traditional use often evokes stereotypical material that reflects basic cultural themes (DOBKIN DE RIOS 1990:197200; WALLACE 1959; cf. also AL-ISSA 1978). This demarcation is not absolute, for as we have seen, psychobiographical material often plays a role in traditional settings, while the idiosyncratic material manifested in non-traditional settings is typically couched in forms which reflect the cultural background of the subjects (MOGAR 1972:406; GROF 1976:118-120).

Of central importance in interpreting these divergent effects is the fact that in traditional societies the ingestion of psychedelics is typically a sacred act which occurs within a ritual context. Rituals are stereotyped activities "directed toward the problem of transformations of state in human beings or nature" (WALLACE 1966:106). Because of their stereotypical structure, they provide a standardized external framework which allows the participants to trustingly suspend their own internal framework, i.e., their personal universe. In contrast to the use of these substances in non-traditional contexts, such rituals tend to guide the participants toward culturally-shared goals (DOBKIN DE RIOS 1990:205) because the pre-session instruction typically provides a "plausibility structure" (BERGER & LUCKMANN 1967:157-159) which explicitly delineates the world which the drug-induced experiences will reveal. Because such experiences are normally construed as lying within the domain of the sacred, the paths to such knowledge have been termed "bridges to the gods" (RÄTSCH 1992). Traditionally, psychedelic rituals of knowledge are undertaken for the good of the group as well as the individual. The insights gained through these rituals "serve to make quite distinct both those areas in which the individual is in harmony with the world around him and those areas in which harmony is lacking" (RÄTSCH 1992:31)

Both the ethnographic data and the findings of clinical research into psychedelic drugs indicate that when used properly, the desemanticizing effects of these substances makes it possible to uncover sources of psychological stress in the individual and social stress in the group. As models of the world are detached and the affective charges linked to these models loosened, the mind becomes in effect a spectator to the information reaching its awareness. The loosening of some models may mean that other very highly charged models which were previously suppressed may become accessible to the mind, thereby making it possible to consciously abreact them. Thus, while some persons ingest these substances as part of an active attempt to discern sources of tension, such stress may also become manifest during a psychedelic session even when there was no prior awareness of any particular problem. In extreme cases, this can lead to a psychotic break which, in the Western context, may necessitate the administration of antipsychotic drugs or even hospitalization (SMITH & ROSE 1967-68; COHEN 1985; SMITH & SEYMOUR 1985). However, any such termination of the negative effects which can arise in a therapeutic setting may also leave important material unresolved, and this in turn can lead to a continuation of these negative effects long after the session has ended (GROF 1976:91-94). For this reason, some experienced psychedelic therapists argue that it is better to help the person work through this material, however painful this process may be, and achieve a positive resolution (STOLAROFF, personal communication). Such effects can, of course, also occur in traditional settings; here, the long period of training of the shaman or other ritual leader is intended to prepare them to deal with such occurrences.

5. Psychedelics as Problem-Solving Devices

The common denominator of psychedelic experiences, whether they take place in a traditional or a non-traditional setting, is the temporary detachment of the interpretive models—the personal universe—which a person has acquired and developed during his lifetime. These models serve many purposes: they define the nature of the unseen universe and the identities and characters of the beings who dwell there, they explain events which transpire in the observable, consensual world, and they delineate such private and personal domains as body-image and value systems.

When used under the proper circumstances, the abilities of psychedelic substances to detach cognitive models from the possibility of sensorimotor verification and to decouple the affective charges attached to those models has great adaptive significance. Transcending these models, which in a very real sense takes the individual back to a time before they were first developed, makes it possible to replace them with others. Alternately, the loosening of affective charges also makes it possible for a new affective charge to be assigned to a previously acquired cognitive model. Both of these possibilities allow psychedelics to be characterized as problem-solving devices.

As discussed above, the personal universe provides a framework within which the individual can carry out the business of his life. Yet because the models which make up a personal universe are acquired and developed by an individual (who has a unique genotype and a unique biographical history), they will always be idiosyncratic (BAKER 1989:31-48); hence, they will always be insufficient to fully interpret and predict events in the general universe. Because of this, on occasion these models can and will be *wrong*.

Like all hypotheses, mental models about the meaning of sensory data are capable of being falsified. This occurs when subsequent sensory data demonstrates that the course of action resulting from a particular interpretation of an earlier set of sensory data was not correct, i.e., that the response they elicited to an event which occurred in the world was not appropriate. For example, our driver, having maneuvered herself out of the way of that truck, may then realize that the object she saw was really a passing train, and thus posed no threat.

The potentially maladaptive fact that the personal universe is necessarily inadequate is tempered by the fact that it can be changed. It and its components are *mutable*. One way in which change can occur is when data is perceived as novel enough to merit constructing an entirely new model. Another possibility is that as experience accrues, certain previously unnoted features about sets of sensory data may be detected, and subsets of a pre-existing model may be developed (as when a child learns to distinguish between ducks and geese, both perhaps formerly lumped under the rubric "water birds"). A third possibility is that elements of previous hypotheses may be recombined with elements from other models of reality and with new elements.

The classic anthropological statement of how this latter process of innovation occurs was provided by HOMER BARNETT, who noted that "the essence of change... lies in the restructuring of the parts so that a new pattern results, a pattern the distinctness of which cannot be characterized merely in terms of an increase or decrease in the number of its component elements" (1953:9). Another anthropologist, ANTHONY F.C. WALLACE, has suggested that this process involves an "automatic alternate-schemata synthesizer" (1970:79) which "is responsible for reorganizing what has been learned, constantly recombining and differentiating elements in novel arrangements, going beyond information given, solving contradictions, and sometimes innovating new schemata" (1970:78). WALLACE considers this process to be an innate function of the brain.

A number of scholars have postulated the existence of such a mechanism or process (see, e.g., HARRIS 1965:363ff; COHEN 1970:214), which does not function solely to resolve emotionally-laden psychological conflicts. THOMAS KUHN (1970:111-135), for example, noted that a scientific revolution normally entails a gestalt shift among scientists, who afterwards work "in a different world" (1970:121). While the revolutions studied by KUHN involved major changes in the ways in which scientists view the phenomena they investigate, this same process can also cast light upon less extensive shifts as well. Many scientists have solved intellectual problems when they were not actively working on them, e.g., while taking a walk, falling asleep, etc. For example, AUGUST KEKULÉ first conceived of the ring structure of the benzene molecule when he had a vision of a snake who grabbed its tail with its mouth while he was dozing (PROGOFF 1959:219-220), and Archimedes is said to have suddenly understood the concept of specific gravity while bathing.

These examples demonstrate that when the focus of attention is shifted away from a problem, the various considerations involved in that problem can be temporarily detached from their usual relationships with one another in a manner analogous to that in which aspects of more deep-seated models are detached from one another during altered states (in fact, WALLACE [1970:78-79] suggests that the same mechanism is responsible for both). When this occurs, what previously appeared to be unrelated elements of a puzzle can fall into place.

It should be stated, however, that the simple ingestion of a psychedelic substance does not guarantee creativity, for psychedelics only appear to augment faculties that are already present. For example, STAFFORD & GOLIGHTLY'S extensive review (1967) of the creative potentials of LSD led them to suggest that under the proper circumstances LSD could free-up creative "logjams" and thus might prove useful in educational and clinical settings. They concluded that LSD's greatest problem-solving potential "appears to lie in its ability to summon and titillate the creative imagination" (1967:255). KRIPPNER'S later (1985) review led him to a similar conclusion. He too noted that while such compounds may enhance the creative abilities that are already present in a person, they will not make an uncreative person into a creative one.

While creative insights into specific problems are common enough occurrences, from time to time a personal universe may require more radical solutions for more general stresses. Often, these are the product of personal conflicts which arise when an individual's needs are no longer met by traditional social structures (BARNETT 1941; WALLACE 1970:237-238). The anxiety which can result may lead to changes in the cognitive, conative, and affective realms (GRINKER 1959). If no other means can be found to fulfill the individual's needs and restore a sense of belonging, that person can become susceptible to what WALLACE (1956a:635) has termed "an autotherapeutic process that reduces stress". As WALLACE (1956a:636) points out, this stress is not related to the actual contents of the personal universe, but to the degree of disorder among these contents.

An analogy will aid us to envision the processes involved. Anthropology has long recognized the distinction between a social "status" and a social "role". A status is a position held by a person as a member of a group, e.g., shaman, warrior, teacher, father, etc. Roles are the sets of behaviors and values expected of a person in a particular status. Because people typically occupy more than one status, the roles and values—expressed in the personal universe as cognitive models and affective charges—associated with one status may directly contradict the roles and values associated with a different status (WALLACE 1970:230-232). These divergent "cognitive/affective complexes" can rub against one another like mental tectonic plates. Usually, the stresses which result will produce nothing greater than an occasional tremor; from time to time, however, these plates may become locked together, and the stress which can then accumulate may become so great that only a major and potentially disruptive "quake" is able to restore any kind of internal equilibrium (cf. WALLACE 1956c).

Psychedelic drugs, of course, are not the only means by which such mental tectonic plates can be made to move. Handsome Lake, the Seneca Indian who provided the paradigm for WALLACE'S models of "mazeway resynthesis" (1956a) and the sociocultural outcome known as the "revitalization movement" (1956b), received his unifying vision after falling into an unconscious state induced by guilt, despair, and chronic alcoholism. The "cognitive and affective restructuring" (WALLACE 1966:240) which took place in this state substantially reduced the internal stress experienced by HANDSOME LAKE, stress whose source was the increasing incongruity between his personal universe and the changing world around him. In this case, understanding the affective charges linked to many of HANDSOME LAKE'S pre-and post-resynthesis models provides a key to understanding the shift between his old and his new ways of interpreting the world (BAKER in press).

Similarly, BACHE (1985) has suggested that TERESA OF AVILA's mystical experiences were the expression of a need to work through psychodynamics similar to the "systems of condensed experiences" proposed by GROF (1976). Pointing towards a more fundamental triggering level, HELMINIAK (1984) has argued that innate neurological conditions (such as temporal lobe epilepsy) can also generate experiences so profound that they may lead a person to radically change his way of life.

As FISCHER (1976) pointed out, meditative states represent a further pathway towards transcending the personal universe and thereby helping resolve internal tension. In meditative states such as that induced by the practice of "transcendental meditation", the low sensory/motor ratio leads to a condition in which there is a minimum of information being made available to the mind. In such states, the reduction of internal stress normally occurs without the mind becoming aware of the source. In contrast to psychedelic substances, the restructuring of the personal universe which results from transcendental meditation usually occurs at a much more gradual pace and with less emotional involvement (BAKER 1989:225-231).

Psychedelic substances thus represent but one pathway for manifesting and hence removing incongruities between the personal universe and the general universe. What distinguishes the psychedelics from other techniques for voluntarily inducing alterations in consciousness is the rapidity with which they act and the depth and extensiveness of the material they can help make manifest. Indeed, psychedelic substances are predisposed for catalyzing major shifts in a person's personal universe. These "desemanticizing drugs... interfere with the ability to assign meaning to previously familiar data (WALLACE 1966:240), and thus quickly produce a state in which the individual stands apart from the models which normally provide a sense of orientation in what would otherwise be an overwhelming world.

In many societies—including our own—the idea that knowledge gained along the psychedelic pathway can be as valuable as knowledge gained through other procedures has been a subject of contention (see, e.g., DAISSETZ 1971 and the other papers in that volume; a more affirmative view is offered in SMITH 1964). Even such an insightful scholar of religion as MIRCEA ELIADE downgraded the use of psychoactive compounds. ELIADE (1964:33-66) gave a number of examples of death and rebirth experiences which a novice must undergo on the way to becoming a shaman. Typically, the shaman undergoes some form of suffering before attaining the experience which imparts the knowledge of his new profession. ELIADE, however, emphasized the psychopathological catalysts of the shaman's calling (1964:23-32), while claiming that

"in shamanism itself, narcotics already represent a decadence and that, in default of true ecstatic methods, recourse is taken to narcotics to induce trance (1964:417)."

ELIADE's interpretation has recently drawn sharp criticism from RIPINSKY-NAXON (1993:132), who explicitly points to the central role which hallucinogenic substances play in many contemporary shamanic belief systems around the world. At the same time, RIPINSKY-NAXON cautions against moving to the other extreme and seeing psychedelics as the only method of consciousness alteration used by shamans: "one must heed the warning that not all shamanistic beliefs, at least among those observed today, are based on—or have been connected with—the use of hallucinogenic substances" (1993:206). Here again is an example of the manner in which preconceived attitudes about altered states of consciousness tend to obfuscate the issues. The emotional aspects of the debate concerning drugs in general and psychedelics in particular create more confusion than insight; certainly, it is as erroneous to overestimate the role and importance of these substances as it is to downplay them.

6. Discussion and Conclusions

The evolution of the mind, and the dynamic interaction between it and the brain, has made it possible for *Homo sapiens* to develop extremely complex and abstract models of the world. In normal states of consciousness, these models enable the individual to quickly assess sensory data and to make decisions on the basis of these assessments. One corollary of the fundamental role which such models play in everyday life is that once they have been developed, they will not normally be superseded even when it is obvious that they are no longer appropriate (WALLACE 1970:203-204).

Altered states of consciousness represent one possibility for modifying previously acquired models. When the mechanisms which maintain the personal universe are suspended, the models which make it up are cut *off* from the possibility of verification, and this in turn makes them more tractable to a process which can result in a reduction of the tension between the components of the personal universe and between the personal universe and the general universe.

Although the present discussion has focused on psychedelic substances, these drugs represent but one pathway for altering consciousness. In certain meditative states, e.g., the brain receives little sensory and/or motor data, and there is thus little for the mind to become aware of. Moreover, since meditators are often instructed to disregard any thoughts, sensations, images, feelings, etc. which may arise during meditation and to focus instead on the practice itself, such methods of altering consciousness are not as likely to make manifest the internal dynamics of the personal universe.

In contrast, the states induced by psychedelic compounds are characterized by a condition in which the mind becomes a more or less impartial observer of the contents of the personal universe. From this position, incongruities within the personal universe and between the personal universe and general universe can be readily discerned, and this in turn makes it possible to develop alternate models to replace them. When this occurs during a psychedelic session which takes place in a non-traditional setting, these models will tend to be idiosyncratic and, if they are useful, their transmission may help to introduce new elements to a culture. In contrast, when psychedelic sessions are conducted within a traditional ritual setting (e.g., for the purpose of initiation), then the models which may be adopted by an individual will typically include those which that culture has proffered prior to the session as part of its "plausibility structure" (BERGER & LUCKMANN 1967) for explaining what occurs in such states.

Thus, in a very real sense, consciousness alteration can be a problem-solving device. When they are detached from their habituated background, models of the world become more open to an apparently innate process through which their component parts may be reshuffled and combined into new models of reality. Of course, the utility of those models must then be evaluated after the return to "normal" consciousness.

Psychedelic substances represent a potent class of agents which rapidly and radically detach the models which make up the personal universe. In doing so, they can also loosen the affective charges attached to such models. Used incorrectly, they can result in even greater dis-stress within an individual's personal universe. To maximize the constructive potential of psychedelics and minimize their potential for harm, we should learn from those specialists who have been using these drugs for countless years: the shamans, healers, and religious practitioners of traditional societies. The ritual framework within which such use takes place provides a strongly supportive "setting", while the culturally proffered explanations for both the drug effects and the meaning of the material which they evoke present the user with a "set" that does much to obviate possible negative effects. Indeed, some Western therapists have adapted traditional ritual forms for their work (see, e.g., YENSEN 1985:275), and there is evidence that many "street users" of psychedelic drugs have developed their own versions of rituals, often based upon such traditional use (DOBKIN DE RIOS & SMITH 1976, 1977; SMITH & SEYMOUR 1985:303; DEKORNE 1994). As Westerners grow wiser about the effects of these substances and the variables which condition a psychedelic session (see STOLAROFF 1993), it may become possible to overcome our prejudices concerning such substances and make more effective use of their problem-solving potential.

It should be noted, however, that the ability of the individual to transcend the universe which he or she has created has implications which go far beyond the mere possibility of solving problems by resolving incongruities. The temporary suspension of the models which a person uses to interpret the world (and which in turn separate the individual from the world) results in a state in which the *individual as a construct* is also transcended. In this state in which there is no "I", experience becomes self-referential. Experienced as a state of wholeness, this state lies at the core of many religio-mystical traditions. Yet it can only be interpreted, described, and communicated after the fact by using models either proffered by the culture or developed by the individual.

Writing in the years immediately preceding the explosion of interest in psychedelic substances, ABRAHAM MASLOW (1948) noted how the process of interpreting fresh sensory data by drawing upon previously learned categories (a process he termed "rubricizing") cast the world in a static and repetitive light. He suggested that transcending this condition enabled a person to once again experience the world as a whole: "It may even be that the so-called 'mystic experience' is the perfect and extreme expression of this sort of full appreciation of *all* the characteristics of the particular phenomenon" (1948:37; emphasis MASLOW'S).

As MASLOW implied, this experience is among the most profound available to a human being. As such, it may allow a person to define a new path for himself. In addition to its implications for the individual, its meaning for the group can be profound as well. Group living depends upon shared values and meanings; transcending these can call them into question. As HUMBERTO MATURANA (1980:xxviii) has noted:

A human being operating as an observer... can always define a metadomain from the perspective of which he may see his participation in the various social systems that he integrates, and find it contradictory. Conduct as observer by a human being implies that he stands operationally as if outside

the various social systems that he otherwise integrates, and that he may undergo in this manner interactions that do not confirm them. An observer always is potentially antisocial.

Psychedelics, then, are a double-edged sword. Used incorrectly, they can undermine the sources of individual stability. Used correctly, they can enable a person to stand back and reevaluate his position in and relationship with the world. Any attempts to use these compounds in a constructive manner must bear in mind that the psychedelic pathway is a means to an end, not an end in itself.

Notes

1. This paper benefited from comments on earlier drafts by CHRISTIAN RÄTSCH, MYRON STOLAROFF, and MICHAEL WINKELMAN.
2. The concept of mind, of course, is an extremely "fuzzy" one (ZADEH 1965), and any discussion of whether other animals than humans have minds is hence fraught with terminological as well as methodological pitfalls. This notwithstanding, I have argued elsewhere that evolutionary considerations suggest that denying mind to animals is problematic as well (BAKER 1989:81 ff.). On the other hand, there has also been less than universal acceptance of the idea that humans have minds. The Behaviorists, for example, reacted to the excesses of the Introspectionist psychologists by summarily banning concepts such as mind and consciousness from scientific consideration (cf. WATSON 1928), while many recent philosophers, in an effort to avoid ontological complications, have simply equated mind (and consciousness) with brain processes (e.g., PLACE 1956:45; SMART 1959:143; ARMSTRONG 1968:94). Since, however, in the present discussion I am viewing mind solely from an operational perspective, it is not necessary to address these philosophical issues.
3. The idea of "emergence" (MORGAN 1923) posits that at certain times during the evolution of the universe, the interrelationships between phenomena become so complex that qualitatively new phenomena emerge whose properties could not have been predicted from any knowledge of the properties of the components of those systems. For example, some large molecules are able to replicate themselves, a property which could not be predicted from a knowledge of their parts (PLATT 1961). Similarly, living systems exhibit properties which go beyond those of their non-living components (POLANYI 1968); they thus represent a *qualitative* step "up" from the physicochemical processes that support them.
4. A discussion of the alternatives to Interactionism would take us far afield of the topic at hand and is not necessary in the present context. It should, however, be explicitly stated that I am making no ontological assertions with respect to the dualist (or monist) point of view, and that the Interactionist model used here is intended solely as a heuristic device to clarify certain aspects of the relationship between the brain and the mind that are germane to this discussion.
5. Everyday experience shows that if the mind does in fact become involved in these activities (as, e.g., when a person is nervous before a musical performance), then the performance of the task will oftentimes not be as good as it was during practice. Since these behaviors have become habitual, they tend to be controlled by lower-level structures. High-level "interference" (such as thinking "What should I do now?") appears to affect the time required to process these tasks, thereby interfering with the previously learned, finely-tuned sensorimotor loops. This suggests that at least one reason why "pushing the envelope" while, e.g., driving, skiing, skydiving, or doing any other task which requires a person to be totally absorbed in the situation at hand may be exhilarating is because the trained responses run automatically, so that the mind "steps back" and becomes, in effect, an observer.
6. In this definition, I have purposely used the phrase "interacting with a brain" in order to accommodate the possibility that under very specific circumstances, a mind might be able to interact with a brain different than the one

it is normally "involved" (MORGAN 1923) with. THOULESS & WIESNER (1947), for example, have suggested that the so-called psi processes of extra-sensory perception and psycho-kinesis may be exosomatic examples of the same interaction that normally occurs endosomatically between the mind and brain of one individual. Regardless of the correctness of this view, the implications of such phenomena are profound. As the philosopher DAVID ARMSTRONG (1968:364) has noted: "the claims of psychical research are the small black cloud on the horizon of a Materialist theory of mind".

7. The phenomenon of "lucid dreaming" (LEBERGE & RHEINGOLD 1990), which occurs when a person realizes that the experiences he is having are occurring within a dream, may represent a threshold state of consciousness in which the mind is starting to become aware of information reaching the liaison brain.

8. Use of these substances, of course, often occurs in conjunction with one or more of LUDWIG'S remaining four categories, a fact which certainly increases the potential for inducing non-ordinary states of consciousness. An extreme example of this is the profound sensory overload provided at "rave" parties, where loud, highly repetitive music is played in a dance environment which typically includes strobe and variously colored lights, fog machines, and other sources of sensory stimulation. Raves typically begin late at night and last until morning, and the people who attend may use a variety of substances to modify their consciousness and give them the endurance to dance through the night. For example, one survey of regular attenders on their patterns of drug use at raves revealed that at some time approximately 75% had taken LSD, about the same number had used MDMA, and a slightly lower number (= 60%) had used marijuana. Other drugs used were alcohol (= 20%) and cocaine (= 10 to 15%). Little use of heroin and amphetamines was reported (Holland 1993). One person I spoke with who attended raves in California reported that some individuals ingest a combination of LSD and MDMA, a procedure known in this subculture as "candy flipping".

9. Although LEWIN included plants containing the tropane alkaloids atropine and scopolamine (particularly *Hyosoyamus* and *Datura* species) in the category of "Phantastica", he acknowledged that the effects of these plants are distinct from those of the other members of this category (LEWIN 1981 [1927]:174-176). These same differences led LEUNER (1981:33-34) to distinguish between two categories of hallucinogens. LEUNER'S Category I includes such substances as LSD, mescaline, psilocybin, psilocin, tryptamine derivatives, and to a degree *Cannabis*. Category II includes atropine, hyoscyamine, and other anticholinergic substances.

10. LSD is the most potent of the major psychedelic drugs. Cross tolerance has been demonstrated between LSD, psilocybin (ISELL, WOLBACH, WINKLER & MINER 1961), and mescaline (BALESTRIERI & FONTANARI 1959; WOLBACH, ISELL & MINER 1962), suggesting that these agents affect similar biological pathways. Thus, in many ways, LSD represents a paradigm for understanding hallucinogenic substances in general.

11. *Ayahuasca* is a decoction prepared from various Banisteriopsis species (the principle psychoactive alkaloids of which are harmine and harmaline), usually in conjunction with other psychoactive plants. Although a great number of admixture plants have been reported (see OTT 1993:210-223 for a discussion), the most important appear to be those containing the tryptamine *N,N*-dimethyltryptamine.

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