

The Chemical Catalysis of Altered States of Consciousness

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My original intent in this paper was simply to list the many agents known to be effective in altering one's state of consciousness and to discuss their qualitative distinctions and differences. I feel, however, that I should construct some model of a state of consciousness, so that alterations in it as I see them can be assigned to specific chemical catalysts. For those who may have their own conceptualization of a personal state of consciousness and who may take offense at my naïveté in setting up such a definition, I ask patience, for I feel that with the end result we shall agree on many points.

I shall attempt to give my own personal interpretation of this subject, in my own vocabulary, by starting at the end of the title of this essay, with "consciousness," and working backwards. The last portion of this word is "science," but before discussing this I must first venture into the philosophical arena with a personal conception of "reality." Many fragments and subdivisions of the idea of reality have been used as convenient concepts in descriptions of drug-induced changes. Terms such as "unreal," "alteration of reality," "separate reality," and "alternate reality" are commonly heard, but I feel that all are inherent contradictions. I hold that there is a single infinite reality composed of all time, all matter, all space, and all concept. The subdivisions that are noted, the Eddington space-time continuum, the logical-digital as opposed to the artistic-analog, the hallucinatory as opposed to the objectively verifiable—all are useful means of organization, but all are, *in toto*, still parts of this single reality. This reality contains our finite universe, and all the infinite interactions between the components within it. It contains the prejudices, the misinformation, the lies, and the superstitions to be found in our social history, and it contains all conceivable miracles. It contains you yourself, if you believe it to. Thus there can be no states of reality or of contradictions within reality that are not part of this whole.

Nothing can be nonexistent, as this very concept assures it a place within our complex unity.

Science is, quite literally from its latin origin *scientia*, knowledge. It is the complete knowledge of this single reality in all of its microscopic detail and in all its integrated purpose. Within our limited ability to communicate (this is a key word and the heart of the concept of chemical catalysis which I wish to discuss in detail), the scientific approach to knowledge is our personal search for information. The term "scientist" is the correct title of the searcher. I mean scientist here in the Renaissance sense, not in the perverted meaning which has become current idiom. One thinks of a scientist in modern day as an architect who designs or as an engineer who builds; however, these individuals are technologists who have specialized in areas of technical discipline, and who have both mastered that which is known in it and developed polished skills in its application. Sadly, there are very few in these areas who search for new worlds purely for the human love of questing.

Our society has provided an extensive educational process which has prepared these technologists and has promoted an unprecedented development in the physical arts (physical sciences). Our observations of nature have given birth to statements concerning natural behavior, and the use of these man-made laws of nature has proved productive but, unfortunately, inflexible. These laws cannot be relaxed to accept any unexpected interactions within our only reality, interactions which might be surprisingly rewarding. The "scientific" process has been made sacred. Our culture has evolved a tautologous dogma: that being well educated is synonymous with being knowledgeable. This process, although mandatory for the development of our society, does a disservice to the individual in that an honest response to stimuli that lie outside our educational framework must perforce be excluded from our "acceptable" community state of consciousness.

The word "consciousness" unites the term "science" with the prefix "con-" meaning with or together. Consciousness, then, embraces the totality of one's personal collection of known facts, believed facts, and taken-on-faith facts. Within one's consciousness, no sense can be made of distinctions between true or untrue, or between provable or unprovable, as these are technologist's terms. Many words have been used to describe the touching between body of fact (consciousness) and total fact (reality), but I have chosen the word "communication" to express this contact.

Within this definition of consciousness, one's "State of Consciousness" may be described as the available constellation of known aspects of reality, at the given moment NOW, which in an intellectual sense both arms a person and limits him. The term "intellect" embraces all modes of human expression from imagination to insight. The restriction "at this moment" is needed in my definition, for one's present state of consciousness is the only possible state of consciousness. All altered states are either past or future. As one changes the body of memory detail available, one continuously undergoes a change in one's state of consciousness. The input of new material (experience) and the deletion of old material (amnesia) make available to the individual a continuously changing collection of bits and pieces, which, of course, constitutes an alteration of one's state of consciousness. Both processes, that of experience and that of amnesia, represent a diseducation procedure. One may be freed from taught survival values by the invocation of memory structures, undoing in the backwards sense all the rote and conditioning insisted upon through the formative years in school. One may express awareness of the inherited survival values by becoming an independent individual and contesting each reflex action that is evoked by social interaction. Borgson has described this well in his theory on memory:

The function of the brain and nervous system, and sense organs, is in the main eliminative and not productive. Each person is at each moment capable of remembering all that has ever happened to him, and of perceiving everything that is happening in the universe. The function of the brain and nervous system is to protect us from being overwhelmed and confused by this mass of largely useless and irrelevant knowledge, by shutting out most of what we should otherwise perceive or remember at any moment, and leaving only that very small and special selection which is likely to be practically useful.

Blake has spoken of this hiding of reality from an opposite viewpoint, but one which leads to the same conclusion. A well-known phrase of Blake's is often quoted in part, in emphasis of honesty of observation: "if the doors of perception were cleansed." But the entire quotation lends support for this thesis of a unified reality: ". . . if the doors of perception were cleansed, everything would appear to man as it is, infinite."

Two rates can be observed in the alteration of one's state of consciousness. One is the slow and unalterably progressive change that has already been discussed. This accumulation of information is gradual and is the result of scientific inquiry.

Through a continuing exposure of a person to reality there is certain to be some interchange of understanding through an increasingly large number of areas of contact. However, the rate of exchange resulting from this interaction can be accelerated or de-accelerated, and it has been often observed that a single concept or simple chemical can serve to greatly change this rate.

By usual definition, a catalyst is a material that brings about some change without itself being noticeably modified. This is a poor definition of a drug, for there are few chemicals that are not themselves somehow modified within the body, producing a sequence of chemical forms. The argument will always be raised that one of these derived forms might, in fact, be responsible for the observed transformation.

A better definition comes from the physical sciences: namely, a catalyst is a material that greatly changes the rate of a natural process. The process may indeed be slowed, and I can only reiterate that the social education system is a negative catalyst of awareness change. On the other hand, the processes may be accelerated. These are positive catalysts. A strong emphasis must be placed on the fact that drugs do not *do* things, they merely allow things to happen, although perhaps at a changed rate.

Baudelaire correctly observed: "Drugs can add nothing new to a man, but can only raise to a higher power that which is already within him." Hess has phrased it as follows: "Psychodysleptic drugs only provoke symptoms which are already potentially present within the cerebral organization."

Exactly what terms should be used in referring to such chemicals? The term "psychodysleptic" can be used, but it indicates that the user has had a European medical education. "Hallucinogenic drugs" implies that there are hallucinations generated, and this is a rare occurrence. The term "psychotomimetic" is widespread in the medical literature. This stems from the early belief that there was a recapitulation of the schizophrenic syndrome observed in the intoxicative state produced by these drugs. This "genesis of psychosis" proved to be largely misleading, and this term has dropped out of use except in the medical literature where there is a need to appear unbiased. The term "psychedelic" has wide popular usage, but it implies a virtue associated with such drug experiments, and it is etymologically unsupportable. However, proper or not, this term has been broadly used, and I will use it without prejudice.

The psychedelic drugs are those which can alter man's intellectual integrity, and can provoke a reversible alteration of one's state of consciousness. Such modification is the direct reflection of the extent of communication between a person within his own consciousness and the rest of reality outside him. There is a continuous and gradual change which is always altering one's awareness of this outside world. However, there is also the possibility of acute disruption which will expose one to new material without preparation, and which will produce changes that are only partially reversible. Communication here must be expanded in that contact must be maintained with out-of-body or, better, out-of-mind reality.

Before I try to build up a model to explain this, let me explain my concept of communication.

The Gospel according to St. John begins: "In the beginning was the Word, and the Word was with God, and the Word was God." In the Greek transcription of the New Testament, the word for "the Word" was *λόγος*, meaning word or thought or discourse. The order of the words has been reversed, and the concept intended was that in the beginning there was discourse. But in the Hebrew version, the order is as in English, and one finds *הַדָּבָר* which can serve dual purpose. It is the "dictum" from Him to us ("the Word was God," the sense of the Greek form), but it is also the reply in that we must provide a definition to the "thing" that is with us ("and the Word was made flesh"). Thus to a statement made, there is a statement in response; in short, communication. Perhaps the phrase *הַדָּבָר הָאֵלֹהִים* was intended to provide an identity: God equals communication.

The capability of communication was the hope of contact with creation and reality. Communication itself was the vehicle of sensory honesty.

Even the simplest organism must thrust itself against the rest of the universe, and so its surface becomes the quintessence of communication between the inside world and the rest of reality. The only awareness that this body has of interaction is through afferent communication reaching him inwardly through this interface, and his own efferent reply. Even in this simplest model of an individual, there is still a generalized response to an outside stimulus. Although the afferent impulse may be only diffusely recognized, it is still possible to modify the intensity of this input. This awareness is expressed and transmitted by the peripheral neural structure, and there are many drugs which modify this incoming communication. Strychnine can be a sen-

sory stimulant that is effective at peripheral levels, and if the senses are sufficiently amplified there are convulsive seizures provoked by even minor stimuli. Many of the local anaesthetics, such as benzocaine or procaine, can effectively isolate such a simple individual from all external awareness.

The reflexive response to the outside world, the efferent reply, can also be easily distorted. It can be exaggerated by many nerve poisons that achieve their pharmacological action by a neurological collapse of control, for example, the carbamates or phosphates. Conversely, response can be quieted by paralytics such as meprobamate or curare. These drugs, modifiers of ingoing and outgoing communication, affect the responses to the somatic body, to the animal in man, and are quite far removed from the cerebral processes which are of immediate interest. This is the simplest possible communication loop. An afferent impulse is diffused through a broad network of neural synapses, which upon mobilization emits an efferent response.

As simple life forms evolved in complexity, this neurological structure progressively became more organized and more localized. The body of input signals is known as the sensory stimuli, which are transmitted to a coordination center. From here, there arises a reply, an output burst of signals called motor responses that are transmitted back to the peripheral world outside. The integrity of this communication is the definition of animal behavior; the mechanism for the transmissions involved is known as the central nervous system; and the coordination center is known as the brain. This new interface, between the body and the brain, can serve as the site of action of a number of drugs which again can be considered as rate catalysts.

The conduction of impulses inwardly from outside the body, through the body, and to the brain, has already been mentioned. These are the exteroceptive, or sensory, inputs. A second type of input arises from the involuntary regulation and homeostatic balance of the mechanical organs of the body itself. These are the enteroceptive inputs, which are generally beyond an individual's regulation, and often occur without his awareness. One's blood pressure and pulse, for example, are generally controlled without any continuous directed attention. Some of the somatic enteroceptive signals can demand recognition due to physical responses that are secondary to them. Bladder fullness (pressure and touch) and hunger (auditory and musculature signals) alert us in this way.

A third type of afferent signal can arise from the body, but it is due to an intellectual awareness of it rather than to a corporal

reality. These are the proprioceptive inputs, the continuous knowledge of just what the body is, and where it is, at all times. Without any visual or sensory level of confirmation a person somehow knows whether his toes are pointing up or down.

This increased degree of complexity found between an organism and its environment, the complex motor instruction conceived and organized within the brain, must pass out to the body, or through the body to the outer world, employing this new interface. These efferent efforts may be separated into those which are consciously controllable (related to the voluntary nervous system and directed largely to the external sensory world) and those which are involuntary (related to the autonomic nervous system and directed largely to the internal somatic world).

The reciprocity of communication from the body to the brain and to the body again can be interfered with by drugs that exaggerate or drugs that quiet. In the voluntary system, which unites a person's brain with external performance, this interaction is easily amplified by a host of sympathomimetic stimulants such as caffeine and drugs related to amphetamine. On the other hand, the intimacy between motor impulse and motor response can be abruptly attenuated by those psychotropic drugs known as the tranquilizers. The tricyclic agents related to chlorpromazine are effective in quieting psychotic situations that are characterized by inappropriate behavior (over-attention to socially trivial sensory inputs). Communication at the autonomic level is modified by drugs that involve the parasympathetic nervous system. An increased sensitivity results from the use of agents such as pilocarpine, and inhibition results from scopolamine and atropine. These two families serve as antidotes for one another, and yet they are both involved in the delusional chapter of hallucinogenic drug abuse. These amplifications and diminutions of body-brain communication are quite well defined pharmacologically.

There are also chemicals that disrupt, rather than augment or diminish, this interaction. These are the intoxicants, as defined in social rather than in pharmacological terms. Disruption is the early state of disconnection. As a general rule, those chemicals that disrupt with modest usage, such as alcohol, become hypnotics with excessive use. Similarly, those drugs known to be effective hypnotics (disconnectors) at clinically established levels—the barbiturates, for example—are consistently found to be intoxicants at low doses or in the early stages of pharmacological effectiveness.

An effective separation of the brain and the body is produced by a class of drugs known as the hypnotics. The barbiturates have been mentioned in this regard, and there are a large number of broadly abused drugs that need to be included here. The several compounds related to glutethemide (Doriden) and methaqualone (Quaalude) are sedative-hypnotics which provoke a heavy sedation that leads to hypnosis.

We are still dealing with the animal within us, and all of these effects are easily demonstrated in sub-human species. However, with the addition of a yet higher degree of organization—that uniquely human concept, the mind—a new boundary of interaction is introduced, a new interface for drugs that can alter intrapersonal communication. It is here that the class of drugs which we have decided to call the “psychedelics” appears to be effective. This pharmacological action is unique to the human; there has been no convincing demonstration of such properties in animal studies. Psychedelic drugs are the materials that seem to be remarkably effective in promoting changes within the state of one's consciousness. These are the drugs that induce the partially reversible transformation in sensory and intellectual awareness.

I have arbitrarily divided the psychedelic drugs into four groups, based upon a number of qualitative generalities. 1. Some seem to generate states that are invariably cloaked in amnesia. For this reason they are largely ineffective in the promotion of a constructive altered state of consciousness. 2. Some seem to promote states of *conceptual* change, invoking new and unexpected interassociations between previously unrelated bits of knowledge. 3. Some seem to promote states of *perceptual* change, playing mainly upon the external senses. 4. Some call upon past memories and upon past events, whether they be true or synthetic.

In the group that I would call “amnesia-producing,” there are many drugs of both natural and synthetic origins. Plants related to *Datura* or to Mandrake (*Mandragora*) have been used as intoxicants for generations. The black henbane of the Old World was a widely known cosmetic used for pupillary dilation, but its capability for producing a confused and irrational state was recognized. The principle active ingredient in all of these plants is the alkaloid scopolamine. This, and its biogenic ally atropine, represent extremely potent parasympatholytic drugs that have been well explored clinically, and which have served as models for many extensive chemical studies. The geometric features of the molecule closely resemble those of the neurotransmitter

acetylcholine and seem to be responsible for the particular intoxication syndrome provoked by drugs of this series.

Pharmacologically, there is observed extensive (and unreflexive) mydriasis, and some degree of xerostoma with accompanying thirst. Intellectually, a state of confusion is generated, accompanied by hallucinogenic synthesis that is frequently denied later by the experimental subject, and a degree of incoherence lapsing into apparent somnolence. Psychologically recognized symptoms such as apraxia (object blindness), aphasia (inability to express ideas), and agnosia (inability to recognize things or people) are common. Emotional displays (anger, panic, fear) are often evoked. Most of the synthetic drugs considered here are either benzylic acid or glycolic acid, esterified with an amino alcohol. A number of these materials are known in the scientific literature by names such as JB-318 and JB-336 (N-ethyl and N-methyl-3-piperidyl benzilate, respectively). This chemical family is very large: there are many analogs known that are active at levels similar to those employed with LSD (i.e., in the microgram range).

A number of clinically explored dissociative anaesthetics can play a similar pharmacological role. Phencyclidine (sernyl) has received wide currency in extra-prescriptional use under the name PCP. There are a number of related drugs (chemically quite distinct from atropine, but allied in the pharmacological sense) that are capable of generating the confusional state. These are clinically observed and tolerated as side-effects associated with the recovery phase of anaesthesia, but there can be no argument that this "hallucinatory" recovery period can properly be called an "altered state of consciousness." The absence of conscious recall places these drugs in a compromised position from the point of view of the experimentalist who is studying these altered states.

The second classification of drugs involved in the provocation of awareness alteration is the most widely studied of any. This contains drugs that appear to promote understanding from within the person. I have used the word "conceptual" to separate the insightful content of such experiences from the sensory or externally experienced states to be discussed shortly. Many books have resulted from experiences with LSD, and indeed this single chemical is most descriptive of this class of action. I will restrict myself here to a brief discussion concerning close chemical relatives and several botanicals that have similar action.

Although LSD is a completely synthetic substance, there are a large number of plants that upon ingestion lead to a similar in-

toxication syndrome. The seeds of the morning glory (*Ipomoea* spp. and *Rivea corymbosa*) and of the Hawaiian baby woodrose (*Argyrea nervosa*) can substantially reproduce the mental state effected by LSD, through the action of the chemically similar ergot-like alkaloids that are present. A New World psychedelic decoction, Ayahuasca, is prepared from plants of the *Banisteriopsis* genus. This contains harmaline and related alkaloids which, although much less potent than LSD, appear to show a similar nature of consciousness alteration. A number of snuffs are found in the Caribbean area that contain dimethyltryptamine (DMT) as a major ingredient. This chemical is readily available synthetically and has served as the foundation for extensive synthetic studies. It is unusual in that it is one of the few psychedelic drugs to be discussed which is not active via the oral route. The lengthening of the alkyl chains on the nitrogen seems not to change the character of central activity but merely to decrease the potency. Branching of these alkyl groups, on the other hand, increases potency and leads to compounds that are orally active. The 5-hydroxyl analog of DMT is bufotenine, an alkaloid unusual in that it is found in both the plant kingdom (*Amanita* spp.) and the animal kingdom (*Bufo marinus*). It has an undeserved reputation of being a hallucinogen. The methyl ether, however, is 5-methoxy-N,N-dimethyltryptamine, an active component of a wide array of South American intoxicating snuffs. It is highly potent upon inhalation, but again is not active orally. The 4-hydroxy counterpart, psilocin, will be discussed below.

The third classification of drugs discussed here includes those that catalyze responses that are mainly perceptual rather than conceptual. With the use of drugs in the previous group, one generally sees himself in a different light (changes of a personally interpretive nature); but with this group one sees other people, other things, in a new light. Formerly accepted sizes, shapes, and intrinsic significances of all objects in the external world abruptly become suspect.

The best-known plant used as a drug in this classification is the North American cactus *Lophophora williamsii*, or Peyote. Peyote provides an excellent example of the external, interpretive nature of the altered states induced by this class of drugs, in that the plant itself is considered the supreme Deity by many who have formed their religions around its use.

The principal active component of Peyote is the alkaloid mescaline, and chemical modifications of its structure have given rise to many pharmacologically related drugs. Although there is a wide range of potencies represented by members of this family,

such as trimethoxyamphetamine (TMA) and dimethoxymethylamphetamine (DOM, STP), they share with mescaline the property of inducing interpretive changes of the external world by amplification or distortion of the various senses.

A fourth classification has been made to try to distinguish those drugs that can seem to facilitate memory recall. Such drugs would be a boon in the area of psychoanalytic therapy if the presumed recollections were factual and there was no interpretive distortion associated with their presentation. A number of drugs seem to show promise in this direction, such as methylenedioxamphetamine (MDA), its methoxy analog (MMDA), and bromodimethoxyamphetamine (4-Br or PBR). There seems to be little perceptual distortion generated in connection with the facilitated access to subconsciously suppressed material, yet there is fantasy and synthetic imagery that overlap the previous two classifications. More consistently leading to a synthetic sensory construct are drugs such as 4-hydroxydimethyltryptamine (psilocin) and high dosages of *Cannabis* extracts such as hashish. Psilocin (and its phosphate ester psilocybin) are found in the sacred mushroom *Teonanacatl*. This plant has been used in North America for centuries to promote a consciousness alteration, primarily in a religious context. Hashish has been more generally employed in the Old World as a stupeficient. But in the continuum of alteration of the state of consciousness induced by this class of materials there are perceptual states that may properly be called hallucinatory.

This has been an extremely brief distillation of an intriguing family of drugs which we have called the psychedelics. Their use can be constructive, as many philosophers and scientists have demonstrated. There is, however, a negative side to this *ex stasis*. The drugs can also reveal to the user an otherwise well-suppressed personal state that society has condemned as less than sane. As Aldous Huxley has said:

Sanity is a matter of degree. For many visionaries, the universe is transfigured for the worse. Everything in it from the stars in the sky to the dust underfoot is unspeakably sinister and disgusting. Every event is charged with hateful significance. Every object manifests the presence of an indwelling horror, infinite, all-powerful, eternal.

So these altered states of consciousness need not be happy states, and they may have little survival value. But to reject them or to try to deny their existence is to forego the rewards to be gained from the awareness of an increased share of reality. It is to forego true scientific investigation of reality.

The development of a complete and productive society requires the generation of a uniform, stable state of individual consciousness. The development of a complete and productive individual requires access to all possible alterations within his state of consciousness. But each of these is a challenge and a threat to the other, and it should be of concern to all that the means are presently at hand, pharmacologically and educationally, for achieving either extreme. A viable balance must be found.

At the socially-conscious level, the process of education (dis-education, as described earlier) appears to be the most successful procedure. But at the personal-conscious level, I believe that Galileo has stated it well: "You cannot teach a man anything. You can only help him find it within himself." We each have our personal view of reality, but we must always bear in mind that those things which we have come to accept as facts are still only observations. They may help us to understand, but they cannot be the end-goal of understanding. Science, as the term is currently used, confuses the means with the ends.

Knowledge is not a body of facts but rather the degree of communication with reality, and it is in this context that the psychedelic drugs promise to be of value.
