Are Hallucinogens Psychoheuristic?

Stephen Szára

"When I use a word," Humpty Dumpty said in rather a scornful tone, "it means just what I chose it to mean—neither more nor less."

"The question is," said Alice, "whether you *can* make words mean so many different things."

"The question is," said Humpty Dumpty, "which is to be master—that's all." (Carroll 1946, p. 229)

INTRODUCTION

One of the hallmarks of hallucinogenic drugs such as lysergic acid diethylamide (LSD), N,N-dimethyltryptamine (DMT), and mescaline is the extreme variability of the effects produced in human subjects that are not only dose dependent but also heavily influenced by the mental set, or expectation, of subjects and the environmental setting that surrounds them (Faillace and Szára 1968; Freedman 1968; Osmond 1957). This variability is also reflected in the names that have been suggested for hallucinogens in the past, for example, psychotomimetic, psycholytic, psychedelic, mysticomimetic, cultogenic, and entheogenic (Freedman 1968; Osmond 1957; Ruck et al. 1979; Szára 1961).

Is another name for hallucinogens really needed? This chapter argues that the names used in the past have largely lost their usefulness and may be even misleading, and that recent advances in the neurosciences and cognitive sciences have created opportunities for using hallucinogens as tools in attacking the supreme mystery: How does the brain work? In this quest, the author starts with a brief review of the past 35 to 40 years of use of these drugs in which several distinct trends, referred to as eras, can be distinguished. Although the eras are overlapping, some with clear beginnings and fading trails, others survive today to some extent in different contexts.

HALLUCINOGEN ERA

The term "hallucinogen" is widely used and understood in both professional and lay circles, in spite of the fact that hallucinations in the strict psychiatric sense of the word are a relatively rare effect of these drugs (Hollister 1962). What is probably the first reference to hallucinations as produced by peyote appears in Louis Lewin's book published in 1924 in German and later translated into English with the nearly identical title *Phantastica* (Lewin 1924, 1964). In this book by the noted German toxicologist, the term "hallucinatoria" appears as a synonym for phantastica to designate the class of drugs that can produce transitory visionary states "without any physical inconvenience for a certain time in persons of perfectly normal mentality who are partly or fully conscious of the action of the drug" (Lewin 1964, p. 92). Lewin lists peyotl (also spelled "peyote") *(Anhalonium lewinii),* Indian hemp *(Cannabis indica),* fly agaric *(Agaricus muscarius),* thornapple *(Datura stramonium),* and the South American yahe (also spelled "yage") *(Banisteria caapi)* as representatives of this class.

As Lewin explains: "Are not 'internal visions,' subjectively considered, real happenings which he who experiences such inward perceptions may regard as true? That is my own view." (Lewin 1964, p. 89) Today's psychiatry makes sharp distinction between illusions (internal visions) and hallucinations. Hallucination is defined as "sense perception to which there is no external stimulus" (Campbell 1989, p. 314). Illusion, on the other hand, is "erroneous perception, a false response, to a sense stimulation" (Campbell 1989, p. 354). The administration of a hallucinogenic drug can be regarded as an external stimulus to which a false response (geometric visual imagery) is made by the human organism. For this reason, "illusion" is a more appropriate term for this effect as long as the subject is aware of the reality of having taken a drug. "Hallucination" indicates a psychotic disturbance only when associated with impairment in reality testing (Kaplan and Sadock 1989).

The term "hallucinogen" was first used by Hoffer and colleagues (1954) and has remained popular ever since, in spite of numerous well-controlled clinical studies with drugs such as LSD, mescaline, DMT, psilocybin, 2,5-dimethyoxy-4-methylamphethmine, or methylenedioxy-amphetamine that found bona fide hallucinations, to which the subjects reacted as real, were a minor consequence of the drug (Cohen 1985; Fischman 1983; Freedman 1968; Hollister 1962).

The report by Hoffer and colleagues (1954) is considered by many as the start of a new era in psychiatric research, taking the suggestion seriously that these drugs reproduce, in normal subjects, some symptoms of schizophrenia or similar psychoses. The drugs, therefore, are psychotomimetic; the terms "psychosomimetic" and "psychotogenic" are also used in this sense. During the mid-1950s, chlorpromazine was made available to treat psychotic patients. Serotonin, norepinephrine (NE), and gamma aminobutyric acid (GABA) were found in synapses in the brain. Reports started to appear implicating the action of these drugs on synapses as the most likely mechanism of psychoactivity (for a review, see Cooper et al. 1974). Psychopharmacology as a discipline was born. There was much excitement, and expectations, among psychiatrists that their profession might finally become scientifically based, and that the knowledge gained would help to develop more effective treatment for their patients.

PSYCHOTHERAPEUTIC ERA

The psychotomimetic era for hallucinogens gradually gave way to a seemingly perverse movement that claimed that hallucinogens could actually help certain psychiatric patients and advocated a psychotherapeutic use of these drugs. The justification was provided by some of the unique and peculiar effects seen and/or experienced in certain situations, such as the loss of ego boundaries and regression to a more primitive, childlike functioning of the ego that seems to facilitate the recall of early childhood memories that have been forgotten or repressed. These effects are utilized by the psycholytic approach to the treatment of chronic alcoholism. It was rationalized that abolishing the distinction between subject and object (ego boundary) and conscious and unconscious self (regression) would cause a lessening of alienation from the world, a rediscovery of the self, and a learning of a new set of values; thus a new beginning could be achieved (Savage et al. 1962). Combining this approach with hypnosis gave rise to the *hypnodelic* strategy for the same purpose. The therapeutic results, however, only lasted for a few months at best, and longterm followup indicated relapse of drinking behavior to essentially pretreatment levels (Faillace 1966; Faillace et al. 1970; Levine and Ludwig 1965).

PSYCHEDELIC ERA

Another peculiar effect of these drugs is a dramatic change in perception: it appears to the person as if the eyes (the "doors of perception") have been cleansed and the person could see the world as new in all respects—"as Adam may have seen it on the day of creation" as Aldous Huxley (1954, p. 17) pointed out in his popular and influential book. This new reality is perceived and interpreted by some individuals as manifestation of the true nature of their mind; hence, the term "psychedelic" was suggested by Osmond (1957). This interpretation has been embraced not only by professional therapists but also by some segments of the public, and gave rise to the "Summer of Love" in San Francisco in 1967 with free distribution of LSD. This perception resulted in the formation of numerous cults, communes, and drug-oriented religious groups (Freedman 1968), permeated the lyrics and style of popular music (acid rock), and was viewed by some as one of the contributing sources of the occasional resurgence of popularity of illegal drug use (Cohen 1966, Szára 1968).

BEHAVIORISTIC ERA

In a review of the clinical use of psychotomimetic drugs, Faillace referred to a group of investigators as "behaviorists...for lack of a better term" (1966, p. 15). This group, he said, "is not principally interested in treatment but is trying objectively to determine the actions of these drugs. A great many investigators from many divergent disciplines are included in this group" (Faillace 1966, p. 16). He then cited four groups as examples.

1. Hoch and coworkers in New York explored the effects of LSD, mescaline, and other similar drugs on psychotic patients and concluded that these drugs aggravate schizophrenic symptoms. The group showed that the drugs brought forth the same type of psychodynamic material in their patients and there was nothing particularly specific for any of these drugs.

2. Isbell and coworkers at the Addiction Research Center, then in Lexington, KY, conducted a series of investigations on former narcotic addicts. They observed rapid development of tolerance to the effects of LSD and also showed the development of cross-tolerance between LSD and psilocybin. This group demonstrated the

feasibility of obtaining good dose-response relationships utilizing an array of physiological tests (e.g., pupil size, blood pressure). The group developed a standardized questionnaire, the Addiction Research Center Inventory (ARCI), that became widely accepted and is used for assessing the subjective effects of psychoactive drugs in a quantitative fashion.

3. Delay and coworkers in Paris carried out an intensive study of psilocybin and showed that the phosphoryl group does not contribute to its psychoactive effects because the dephosphorylated derivative, psilocin, has equal potency in humans. They observed an intensification of psychotic and psychoneurotic symptoms in 90 mental patients and 47 so-called normals, and suggested that psilocybin may offer diagnostic possibilities in difficult clinical cases.

4. Faillace referred to the work of the author and colleagues at Saint Elizabeth's Hospital in Washington, DC, as the last example of nontherapeutically oriented clinical research with hallucinogenic drugs. This work focused primarily on tryptamine derivatives such as DMT. In the course of investigation of the metabolism of these compounds that included the N,N-diethyl- and N,N-dipropyl-derivatives of tryptamine (DET and DPT, respectively), the conclusion was reached that 6-hydroxylation of the indole ring might be an important biological mechanism for the psychoactivity of these compounds. To provide further evidence, the Saint Elizabeth's Hospital laboratories synthesized a number of derivatives of these compounds that were blocked by substitution at the 6-position so as to prevent hydroxylation at this position (Kalir and Szára 1963). One of these, the 6-fluoro derivative of DET, was shown in clinical tests to produce autonomic symptoms and mood changes without the characteristic perceptual and thinking disturbances usually observed with psychotomimetic agents. Although there are some doubts whether 6-hydroxylation is responsible for psychoactive metabolites (Rosenberg et al. 1963), this fluorinated derivative of DET might be useful as an active placebo in clinical studies with hallucinogens (Faillace 1966).

ERA OF LEGAL LIMBO

All these studies were done before 1966, the year that was a turning point in research with these drugs. In response to public anxiety about drug

abuse, Congress passed the Drug Abuse Control Amendment (Public Law 89-74) that went into effect in May 1966. This amended law banned public use and sale of peyote, mescaline, LSD, DMT, and several other similar drugs. Pharmaceutical companies were forced to stop manufacturing LSD and turn over their supplies of the drug to the National Institute of Mental Health (NIMH).

That same month the author was invited to give a paper at the 122nd Annual Meeting of the American Psychiatric Association held in Atlantic City. The original stated, in part:

> This publicity pressure threatens serious scientific research not only with LSD but with the entire class of hallucinogenic drugs. We cannot put blame on the drugs; we can only put blame on the manner and the ways they are being used. It is my belief that it would be most unfortunate if we were to permit undue hysteria to destroy a valuable tool of science and evaporate an eventual hope for the many hopeless (Szára 1967, p. 1517).

Many other investigators voiced similar concerns (Cohen 1966; Dahlberg 1966; Freedman 1966; Klee 1966) before congressional committees and other appropriate forums (Szára and Hollister 1973), but the situation remains the same today. Clinical research with these drugs essentially stopped, with the exception of Strassman's work on DMT (Strassman, this volume) and some treatment-oriented work with LSD such as that on dying cancer patients (Yensen 1985). Some figures on human studies with LSD during the period of 1953-73 are shown in table 1.

THE PSYCHOHEURISTIC ERA

After more than 20 years of deliberate legal neglect and constraints, it is time, especially in view of the current focus on the "Decade of the Brain,"[1] to recognize and emphasize the potentially immense heuristic value of these drugs in helping to explore the neurobiological bases of some fundamental dimensions of psychic functions. With this in mind, the author suggests changing the point of view or attitude of professionals and of the public by calling these drugs by a name other than hallucinogens, psychotomimetics, or psychedelics. These names all suggest that, when these drugs are consumed, they will do something: produce hallucinations (rarely), mimic psychoses (questionably), or "manifest the mind" (whatever that means). In other words, these names

TABLE 1. *Alcohol, Drug Abuse, and Mental Health Administration (ADAMHA) studies of LSD in human subjects, 1953-73*

Type of Projects	No. of projects	Estimated no. of subjects	Estimated funding (in millions)
Intramural projects			
Clinical Center	20	150	$0.5
Addiction Research Center	66	300	0.8
Extramural projects	30	1,300	2.7
Total ADAMHA	116	1,750	$4.0

NOTE: This table appeared in an internal ADAMHA document, "Report on ADAMHA Involvement in LSD Research," prepared by the staff about 1975, based on records available in the agency and on telephone interviews with extramural investigators and former staff members. It contains this statement: "At the present time, ADAMHA does not fund any research involving administration of LSD to humans. This is not a policy, but rather the result of accumulated findings in the field."

suggest that the drugs are in control. In contrast, the psychotherapeutic labels have a different focus and connotation: The drugs are used as tools to achieve some medically desirable effect (either alone or in combination with analytic therapy or hypnosis), that is, the physician is in control in producing some beneficial effects for the patient. It is for this reason (i.e., implying that it is not that drugs are in control, as it is usually assumed in a drug abuse context, but that the physicians and researchers are using them as tools) that the use of the term "psychoheuristic" is proposed.

"Heuristic" is derived from the Greek word "heuriskein," to invent or disover, and is defined in Webster's *New Twentieth Century Dictionary* (McKechnie 1983) as follows: "helping to discover or learn; specifically, designating a method of education or of computer programming in which

the pupil or machine proceeds along empirical lines, using rules of thumb, to find solutions or answers."

The Random House College Dictionary (Stein 1980) gives the following definitions for heuristic: (1) "Serving to indicate or point out; stimulating interest as a means of furthering investigation; (2) (of a teaching method) encouraging the student to discover for himself."

It is in the first, general sense of the dictionaries' definitions that the word psychoheuristic is meant to be used: "helping to discover" and "stimulating interest as a means of furthering investigation" into the mechanism(s) by which some of the unique psychological effects are produced by these drugs and, beyond that, to serve as keys to unlock the mysteries of the brain/mind relationship.

UNIQUE CHARACTERISTICS OF PSYCHOHEURISTIC AGENTS

What are the unique characteristics of the effects of these drugs that point to their potential as psychoheuristic agents? The vivid, mostly geometric visual illusions are one of the hallmarks of LSD, DMT, and other major psychedelics. These illusions are sometimes so intense that they are seen as superimposed on any outside surface, be it a plain white wall or people's faces. As pointed out earlier in this chapter, these visual patterns are seldom perceived as having real outside existence; so they are, strictly speaking, illusions rather than hallucinations. Nevertheless, they are sufficiently striking and sometimes spectacular, so that they have been of some interest to psychologists (Klüver 1967; Oster 1970; Siegel 1977), to physiologists (Evarts 1957; Purpura 1957), and even to mathematicians (Cowan 1988). Some other unique characteristics might be the alteration of time perception, synesthesia, dehabituation, the extreme individual variability of many of their actions, the religious or mysticomimetic properties, and the so-called cultogenic effects. The reader can probably name a number of others.

However, most of these effects are interpretations and/or secondary consequences of the drugs' disturbances of some fundamental physiological or psychological processes that underlie humans' capacity to attend, to be aware of, and to regulate their relationships with the physical and social environment. Thus, the author's recommendation is to use these drugs in a heuristic mode to explore the biological correlates

and perhaps the mechanism(s) of the fundamental process that is frequently referred to by the psychoanalytic term of disturbance of "ego boundaries" or "oceanic feeling." This aspect has been emphasized especially by psychiatrists, among others (Fischman 1983). Freedman, in his much-quoted landmark paper *On the Use and Abuse of LSD,* puts it this way:

> It is my impression that one basic dimension of behavior latently operative at *any* level of function and compellingly revealed in LSD states is "portentousness"—the capacity of the mind to see more than it can tell, to experience more than it can explicate, to believe in and be impressed with more than it can rationally justify, to experience boundlessness and "boundaryless" events, from the banal to the profound. (Freedman 1968, p. 331)

Grof, who has perhaps more clinical research experience than anyone else in the world with LSD and other hallucinogens such as DPT, has concluded that the major psychedelics do not produce specific pharmacologic states (i.e., toxic psychosis) but are unspecific amplifiers of mental processes (Grof 1980). In other words, rather than producing effects that are specific for the drug, they activate mostly unconscious mental processes from various deep levels. These mental processes are specific for the personality of the individual. The major focus of Grof's therapeutically oriented work was to interpret unconscious memories for the perinatal experience of pain and trauma as an example of what he called "temporal expansion of consciousness," and to deal with the so-called transpersonal experiences as a result of spatial expansion of consciousness. The common denominator, he said, "in this rich and ramified group of phenomena is the feeling of the individual that his consciousness expanded beyond the usual ego boundaries and limitations of time and space" (Grof 1980, p. 94).

BOUNDARIES IN THE MIND AND THE BRAIN

The subjective phenomenon of loss of ego boundaries is not restricted to psychedelic experiences. In the twilight states of falling asleep and waking, people go through such experiences every day, although not everyone is fully aware of them. LSD and similar drugs have the unique property of producing similar twilight states while a person is fully awake and aware of them. This characteristic makes these drugs specially suited

to exploring the full extent of these general phenomena, including their postulated biological bases.

The generality of these phenomena is underscored by a broad psychological theory of boundaries proposed recently by Hartmann, a well-known sleep researcher. He put forward this suggestion in his book *Boundaries in the Mind* and claims that these boundaries represent a major dimension of personality that had largely been neglected (Hartmann 1991). In the course of studies on people with nightmares, Hartmann was struck by the observation that such people have a group of common characteristics that could be described as open, unguarded, sensitive, fluid, artistic, and vulnerable. The description that seemed best to encompass all these people was that they had "thin boundaries" in many different senses. In contrast, among the control subjects, Hartmann found a significant group of people who could be characterized as having "thick boundaries" in the sense that they have a very solid, separate sense of self; they keep emotionally distant from most others; and they do not become overinvolved, sometimes appearing inflexible, even rigid. This distinction seems to hold in many areas of interpersonal relations in these extreme groups, but there were people who were in between.

The initial evaluation was based on Rorschach tests (popularly known as inkblot tests) of individuals participating in Hartmann's sleep electro-encephalogram (EEG) studies. Watson (1985) has found EEG correlates of this dimension: thin boundary individuals producing significantly larger numbers of phasic integrated potentials (PIP), also known as ponto-geniculo-occipital (PGO) spikes, on the boundaries of rapid eye movement (REM) and non-REM sleep stages.

Hartmann (1991) also has developed a 145-item questionnaire that could be used to quantify the thick and thin dimensions. The questionnaire covers 12 categories of psychological phenomena such as childhood experiences, interpersonal relations, habits, opinions, and sleep-wake and dream-recall patterns. Most people do not score in the extreme in each category but thick in some areas and thin in others. Among 300 subjects, there was some statistically significant correlation of this dimension to some of the scales of the Minnesota Multiphasic Personality Inventory (MMPI), but a closer analysis indicated that the boundary scale is definitely not measuring sickness or psychopathology.

The concept of boundaries, Hartmann (1991) claims, should be helpful in understanding and preventing the potential consequences of some

psychologically crippling problems and could be useful in counseling for marital problems and career choices. Hartmann did not point it out explicitly, but this concept may also be useful in rehabilitation of addicts, because thin-type personalities may be more vulnerable to peer pressure. Hartmann does mention that among the various psychoactive drugs, the psychedelic types are the only ones that produce a temporary thinning of inner boundaries. None of Hartmann's thick boundary subjects has reported ever taking LSD; only some of the mixed types did. However, one of his thin boundary subject said: "I can see why some people might like this sort of loosening or merging and the vivid images, but it's not for me. I'm too much like that anyway, without drugs." (Hartmann 1991, p. 239). One wonders whether this questionnaire would be useful in drug abuse prevention and counseling, but it would definitely be a good research tool in quantifying the boundary dimension in any clinical experimental study of this trait.

EXPLORING INNER BOUNDARIES

So much for the potential significance of the boundary concept. The question arises: How should one go about exploring the biology of this dimension of personality with the help of psychoheuristic drugs as tools?

Besides the tools that can be considered to be heuristic in the general sense, investigators need new concepts, new guidelines, and new models to serve as positive heuristics in the sense used by Lakatos, the noted philosopher of science, who focused on conceptual and strategic problems in the 1960s and 1970s in defining new research programs (Lakatos and Musgrave 1970). Lakatos' use of heuristics is in the second, specific dictionary sense: Defining some concrete rules that should guide the research. His striking example was from the historical development of quantum mechanics based on the positive heuristic model of the atom by Bohr. Bohr's model is now known to be only approximately true; nevertheless, it resulted in spectacular progress in research that resolved the structure of the atom. In the same spirit, one might use a version of the hierarchic models for the brain that may not be perfect but that might provide better conceptual guidance than the currently used information-processing paradigm.

The source for such a paradigm might be found in hierarchy theory as it is being developed primarily by evolutionary biologists and ecologists (Allen and Starr 1988; O'Neill et al. 1986; Salthe 1985) to come to grips

with the complexities of the thoroughly interconnected ecosystem. These researchers do not look at hierarchy in the sense of rigid organization or classification but as a dynamic control system that can be comprehended only as functioning on three levels simultaneously as a whole (also called a holon): the focal level that is the immediate object of scrutiny, the level above that serves as a boundary of constraints, and the level below that consists of the processes and semiautonomous entities under direct control of the focal level (figure 1) (Grene 1987; Salthe 1985). These scientists prefer to call these models holarchies rather than hierarchies, following Koestler (Koestler and Smythies 1969).

It is generally accepted that the brain is largely hierarchically organized. In the visual sensory system, for example, among the 305 pathways interconnecting 32 cortical visual areas, it is possible to identify 10 hierarchic levels of cortical processing of visual information (Van Essen et al. 1992). However, the application of information-processing concepts is limited to two levels at a time in identifying the anatomical areas where the pathways originate and terminate. The three-level control hierarchy concepts in Salthe's sense have not been applied to central control processes of the brain such as attention and memory or to sensations such as pleasure and pain.

Another discipline that could be tapped for conceptual guidance and for mathematical bookkeeping tools is Game Theory (Dyke 1988; Von Neumann and Morgenstein 1944). Concepts such as competition and cooperation have been widely used in enzymology, in receptor studies, and in neural network models, but Game Theory offers much more than these everyday concepts: mathematical rigor and heuristic techniques that could be applied to behavioral and brain processes for better payoffs (Maynard Smith 1984). Time and space do not allow for an elaboration on these suggestions at this time, but it may be important to stress a few points.

In terms of practical approaches to this level of complexity, researchers should take advantage of the availability of increasingly powerful (and relatively inexpensive) computers and test the concepts and hypotheses first in so-called neural network models. Such models could sharpen the conceptual frameworks and generate hypotheses that, in turn, could be tested on real brains and, to some extent, on real people (figure 2).

Among the other tools that have been refined to high sophistication in recent years is positron emission tomography (PET) scanning, which can

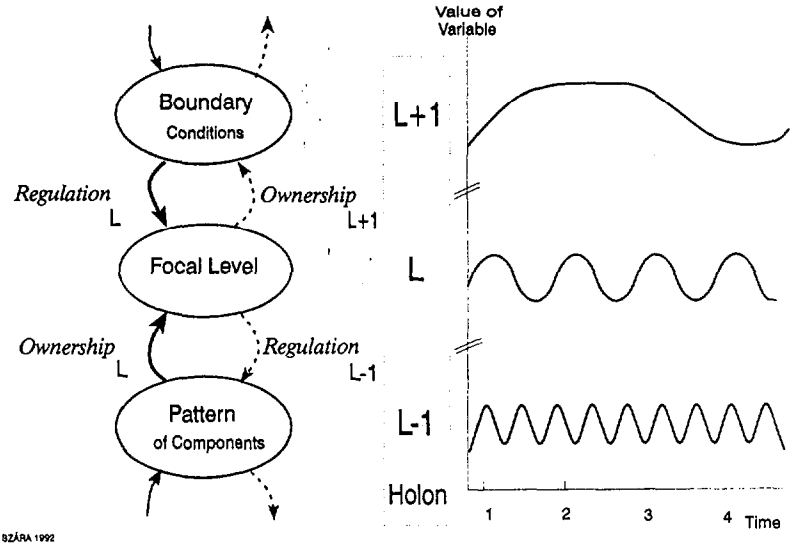

FIGURE 1. *Diagram sketching the principles and dynamic relationships among the components of the proposed game-holarchy paradigm for guiding research into subjective psychobiological phenomena such as boundaries.*

NOTE: In the center of figure 1, L+1, L, and L-1 designate three levels of a holon and refer to both the left and the right side of the diagram. On the left side, in line with L is the focal level of a currently active holon, above which and in line with L+1 are the boundary conditions (rules and regulations) for awareness and action. L-1 represents a pattern of components that is perceived as being under the control (ownership) of the focal level L. When a holon is engaged in a game with other holons, its choice of action is always constrained (regulated) by the rules of the boundary conditions (L+1). Cooperation and competition involve lower level components (residing in L-1) that can be lost or new components gained as payoffs. When the focal level shifts, say to level L-1, then the previous level L becomes the boundary condition that regulates the action of the new holon. Similarly, when the focus shifts to level L+1, the boundary conditions shift one level above, as suggested by the top arrows, and the previous level L becomes a pattern of components that is owned by the new focal level. The right side of the diagram symbolically represents the relative temporal dynamic relationships among the variables in the three levels of a holon.

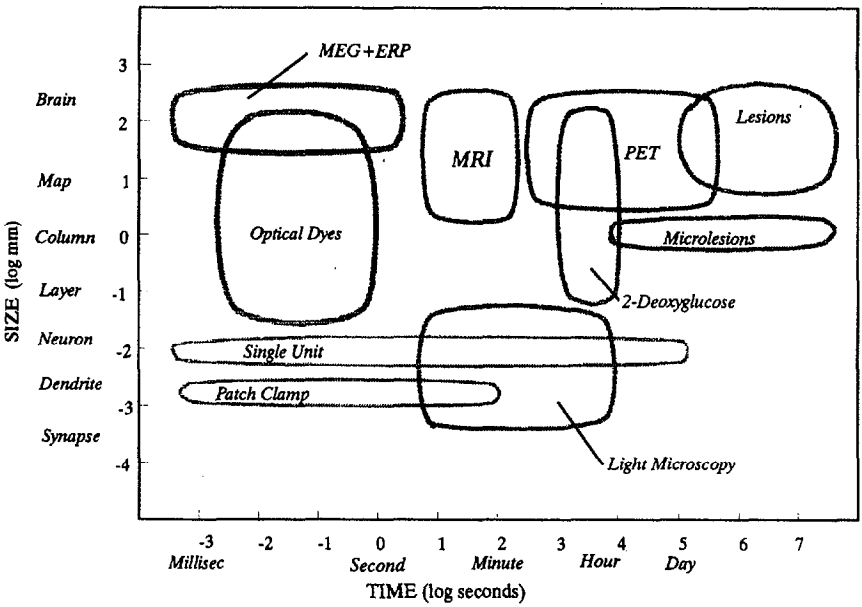

FIGURE 2. *Schematic illustration of the ranges of spatial and temporal resolution of various experimental techniques for studying the functions of the brain.*

KEY: MEG = magnetoencephalography, ERP = evoked response potentials, PET = positron emission tomography, MRI = magnetic resonance imaging.

SOURCE: Churchland, P.S., and Sejnowski, T.J. Perspectives on cognitive neuroscience. *Science* 242:741-745, 1988. Copyright ©1988 by the American Association for the Advancement of Science, Washington, DC.

be used for exploring spatial dimensions and localization of some biochemical (enzymes, receptors) or physiological (blood flow) processes relevant to hierarchic boundaries. Recently, a modification of magnetic resonance imaging (MRI), the so-called fast MRI, was shown to be capable of following regional blood flow in the brain that occurs within seconds after perceptual or cognitive stimulation, in contrast to the several minutes time scale needed for PET scan. A further advantage of MRI is its noninvasive nature; this technology uses intrinsic signals of venous blood oxygenation for imaging (Ogawa et al. 1992). Another technique, evoked response potentials (ERP), might also be useful to resolve temporal dimensions of the same boundaries. These are just a

few examples; many other methods could be profitably employed as required by the questions at hand (Churchland and Sejnowski 1988).

Last, but not least, there are some useful placebos that should sharpen any research design. Bromo-LSD could serve as a nonpsychoactive analog for LSD in a certain dosage range, and 6-fluoro DET can be used as an active placebo for the shorter acting psychoheuristic drug DET as demonstrated more than 25 years ago by Faillace and colleagues (1967).

SUMMARY

The author argues in this chapter for a reconsideration of the perception of hallucinogens as being only toxic, damaging, and therefore strictly condemnable for being abused. The author advocates that hallucinogens be viewed as powerful psychoheuristic tools that, in combination with other necessary conceptual (such as holarchic theory) and laboratory tools (such as PET scan or MRI), may help solve a major mystery of nature: the workings of human brains and minds.

NOTE

The National Institute on Drug Abuse is among the many Federal departments and agencies participating in programs and activities to observe the "Decade of the Brain" beginning January 1, 1990. Additional information about this effort can be found in the bill (H.J. Res. 174, March 8, 1989), which became Public Law 101-58 on July 25, 1989.

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