Creative Performance and the Hallucinogenic Drug-Induced Creative Experience[1]

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That form of creative art which is the most universal of all is the Dream.
— Kubie[22]

The poet Saint-Paul-Roux, according to Andre Breton[3] always hung a sign on his door before going to sleep: "Poet at work." The association between hallucinatory or dream states and creativity was even more specifically stated by Sartre[26]: "Genet writes in a state of dream and, in order to consolidate his dreams, dreams that he writes, then writes that he dreams and the act of writing awakens him. . . . The consciousness of the word is a local awakening within the fantasy; he awakes without ceasing to dream."

We may go one step farther and contend that the dream states,[22] including hallucinogenic drug-induced and other waking-dream states, are potentially creative experiences, even though they do not invariably lead to creative performance. The lumping together of these states is justified by our definition of dreams and hallucinations as experiences of intense inner sensations with simultaneously inhibited or even blocked intention and ability to verify those sensations through voluntary motor performance.[7,10]

It is equally certain that hallucinatory and dream states are not the only conditions conducive to creativity. The art of psychotics, the art of children, primitives and *peintres naifs*, and even that of the mentally retarded, implies that being shut-off partially or completely from the normal state of daily routine may itself foster creative performance.

THE INVERSE RELATION BETWEEN "CREATIVITY" AND "BRAIN-DAMAGE"

Our experimental approach to studying the relationship between dream states and creativity begins with a study of the relation between "brain-damage" and "creativity." "Brain-damage" was measured in a group of 21 college-age volunteers with above-average scholastic performance who were already familiar with the psilocybin experience, by administering to them the Minnesota Percepto-Diagnostic Test,[18] a perceptual test for "brain-damage," prior to (T_1), 90 minutes after (i.e., at the peak of (T_2)), and at the end of (T_3)(i.e., 270 minutes after (T_1), a 160μg/kg oral dose of the hallucinogenic drug psilocybin). Our subjects also completed at T_1, T_2 and T_3 the Myers-Briggs Type Indicator (MBTI), a brief, self-report inventory which results in simple continuous scores on four scales of dichotomous Jungian personality types: extraversion(E)-introversion(I), sensation(S)-intuition(N), thinking(T)-feeling(F) and judging(J)-perceiving(P).[4] From these

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scores the Σ(N+P) or creativity score, which Hall and MacKinnon[2] as well as MacKinnon[25] used to identify successful creative performers among architects, writers and scientists, was extracted.

It should be mentioned that our volunteers are about 95% taste-sensitive, and thus drug-reactive, MBTI intuitors, and about 80% MBTI introverts, who gladly volunteer for an introversive and intuitive drug experience.[11,28] Due in part to this skewness toward MBTI intuition, there is a higher incidence of creative subjects in our sample – i.e., those with higher Σ(N+P) scores.

Prior to the administration of psilocybin (i.e., at T_1), the volunteers also completed a handwriting test,[10,15,28] which yields a mean handwriting area value and its standard deviation (S.D.). The S.D. of this simple perceptual test is a useful indicator of ensuing drug-induced perceptual and/or behavioral change at drug peak (T_2).

Table 1 summarizes our results showing that half of our volunteers (N = 10, see upper half of Table 1) become *less* "brain-damaged" under the influence of psilocybin, i.e., they show less rotation on the MPDT at T_2 than at T_1 whereas the other half (N = 11, see lower half of Table 1) display increased rotation on the MPDT from T_1 to T_2, showing *more* "brain-damage." Not unexpectedly, the S.D. on handwriting area is as always a good indicator of drug-induced perceptual or behavioral exaggeration at T_2: there is a significant correlation between the S.D. on the handwriting area at T_1 and the increase in rotation on the MPDT or *more* "brain-damage" ($r = 0.744$, $p<0.01$, N = 11). (Note: All correlations in this paper refer to Pearson Product-Moment Correlations (r).) There is no significant correlation, however, between the S.D. on the area at T_1 and

TABLE 1

Subjects' initials and sex	S.D. of handwriting area in cm^2 at T_1	Degrees of rotation on the MPDT at T_1	Degrees of rotation on the MPDT at T_2	Degrees of rotation on the MPDT at T_3
E. P.♂	6.51	19.5	17.5	22.5
B. N.♂	3.74	30.5	16.0	15.5
W. K.♂	3.42	45.0	21.0	25.5
L. A.♀	14.54	23.0	10.5	17.5
L. C.♂	5.23	81.0	55.5	25.5
S. P.♀	2.01	16.0	11.5	22.5
C. S.♀	8.29	12.5	10.0	20.5
A. S.♀	7.88	14.5	10.0	15.0
G. K.♂	3.87	13.0	11.5	18.0
G. S.♂	5.45	22.0	21.0	16.0
K. H.♀	7.69	25.0	35.0	34.0
B. M.♂	3.45	7.5	31.0	37.0
Y. F.♀	7.98	19.5	26.0	8.5
R. S.♂	3.33	9.0	10.0	22.0
M.W.♀	6.5	15.5	31.5	17.0
D. S.♂	2.21	7.5	66.0	19.5
A. P.♂	6.99	25.5	30.5	22.0
S. D.♀	4.7	11.0	16.0	17.0
B. M.♂	2.99	13.5	28.0	12.0
J. W.♂	5.65	16.5	22.0	36.0
G. M.♂	3.90	22.5	27.0	22.5

Table 1. 21 college-age volunteers, 10 of whom (see upper half of Table) become less "brain-damaged"—in terms of *less* rotation on the Minnesota Percepto-Diagnostic Test (MPDT)—at the peak of a 160 μg/kg psilocybin-induced experience, i.e., at T_2. The remaining 11 subjects display *more* rotation (or more "brain-damage") on the MPDT at T_2. The standard deviation (S.D.) of handwriting area was determined, and this measure of perceptual-behavioral variability at T_1 was found to be an indicator of increased "brain-damage" at T_2.

MPDT rotation at T_2 for the other subgroup of 10 volunteers (upper half of Table 1), presumably because they display not an exaggeration, but rather less "brain-damage" at T_2 than at T_1. Evidently, the S.D. at T_1 predicts only the exaggeration of perception-behavior at T_2, but not its alleviation.

Interestingly, the MacKinnon creativity scores $\Sigma(N+P)$ of those 17 subjects who, of the original 21, could participate at this stage display a significant inverse relation with degree of rotation on the MPDT. For the 8 (of 17) subjects who show less "brain-damage" at T_1 and T_2, the inverse relation between "brain-damage" and "creativity" is significant at T_1 ($r = -0.654$, $p<0.05$), as well as at T_2 ($r = -0.628$, $p<0.05$) and at T_3 ($r = -0.697$, $p<0.05$). For the 9 (of 17) subjects who show more "brain-damage" at T_1 and T_2, the inverse relation is significant at T_3 ($r = -0.712$, $p<0.05$), and even more so for the entire group at T_3 ($r = -0.710$, $p<0.001$, $N = 17$). This significant inverse relation for the entire group at T_3 is probably due to the delayed action of psilocybin in at least two-thirds of the group at T_3.

WHO IS WHO UNDER PSILOCYBIN?

At this point, 3 subjects who were representative in terms of MPDT rotation were selected from the subgroup which displayed less, and 3 from that which showed more "brain-damage" under psilocybin, and all 6 were administered a figure-drawing test[31] at T_1, T_2 and T_3 of another 160μg/kg psilocybin-induced experience. The instructions for the figure-drawing test are as follows:

> Seat the subject comfortably at a table and provide him with a plain white sheet of paper (8½ x 11 in.) and a sharpened No. 2 pencil. Then read the following instructions: "I would like for you to draw a person. This has nothing to do with your drawing ability, but please try to draw the best person you can. " If the subject asks, neither size of drawing nor sex matters. The subject should be allowed to make his drawing in relative privacy. The experimenter should be as inconspicuous as possible in observing the drawing, in order to prevent the subject from being embarassed by his artistic efforts. He should not feel as if he is being watched.
>
> When the subject has completed the task, mark the drawing "No. 1" and record approximate time along with other identifying data. Now give the subject another sheet of paper and ask him to draw a person of the other sex. When the subject has completed the task, mark the drawing "No. 2" and record identifying data and approximate time, as well as any spontaneous comments by the subject or observations by the experimenter. (Note: If subject should draw only the head of a figure or should omit an essential part of the body, he should be asked to draw a complete figure.)

The 18 male and 18 female drawings obtained from our 6 subjects were duplicated, coded and evaluated independently in a "blind" fashion: (1) according to a sophistication-of-body-concept scale, yielding scores on the Witkin field-dependence-field-independence di-

TABLE 2

Subject	MacKinnon Creativity $\Sigma(N+P)T_1$	Witkin T_1	Witkin T_2	Draw a ♂ at T_2 T.F. aesthetic score (I)	Draw a ♂ at T_2 L.M. aesthetic score (II)	Draw a ♀ at T_2 T.F. aesthetic score (I)	Draw a ♀ at T_2 L.N. aesthetic score (II)
Y. F.♀	70 $\bar{X}$=66.0	+3	U	3	2	3	2
L. A.♀	62 σ=2.3	+3	U	3	2	3	2
E. P.♂	66	+3	U	2	3	2	1
J. G.♀	92 $\bar{X}$=88.6	+2	-3	2	-1	2	1
G. K.♂	74 σ=7.7	+2	+2	2	-2	2	-2
J. W.♂	100	+1	-2	3	-2	-1	2

Table 2. A subgroup of 3 representative volunteers chosen from subjects displaying less "brain-damage" at the peak of a 160 μg/kg psilocybin-induced experience, i.e., at T_2 (upper half of Table 1), contrasted *with* 3 volunteers from those displaying more "brain-damage" at T_2 (lower half of Table 1). The 3 subjects displaying the *lower* mean MacKinnon "creativity" score (Mean = 66.0) prior to drug-ingestion (T_1) are more (Witkin) field-independent at T_1 than the other subgroup, which displays a *higher* mean MacKinnon

mension,[31] graded, on the recommendation of Dr. E. A. Witkin, by Dr. Hanna Marlens, 15 Robin Lane, Huntington, Long Island, New York; and (2) in terms of aesthetic pleasingness by a professional artist, Trudy Fischer, Columbus, Ohio, and by a psychiatrist, Primarius Leo Navratil, M.D., Ph.D., Gugging, Austria, an expert on the art of schizophrenics and the mentally retarded.[23,24]

Adjudicators were asked to score both the field-dependence-field-independence and aesthetic pleasingness dimensions on a scale ranging from -3 to +3, the score -3 representing least field-independence (most field-dependence), and least aesthetic pleasingness.

Table 2 presents our most important results. The 3 subjects who display the *lower* mean MacKinnon creativity score (Mean = 66.0) prior to drug-ingestion (and who thus show higher mean rotation, or more "brain-damage" on the MPDT: Mean = 20.7^0, σ = 1.67), are also more (Witkin) field-independent at pre-drug than the other subgroup of 3 subjects (see lower half of Table 2), who display the higher mean MacKinnon creativity score (Mean = 88.6), and thus less "brain-damage" on the MPDT (Mean = 16.2^0. σ = 2.46). Interestingly, the figure-drawings of the 3 most field-independent subjects are all unratable (U) along the Witkin dimension at drug-peak, although they were consistently found aesthetically more pleasing by the 2 independent adjudicators T.F. and L.N. than those of the other 3 subjects (see lower half of Table 2). The figure-drawings completed at T_2 by the 3 most field-independent subjects (upper half of Table 2) were unratable, according to Dr. Marlens,

> . . . because they couldn't be scored meaningfully on this scale, since the drawings lack representation of the human body, on which the scale is based. Whereas these peculiar omissions and distortions of the human figure certainly indicate a very poor and acutely disturbed body-concept, incompatible with realistic field-independence, the general characteristics of field-dependency and primitivity are also counter-indicated in these productions by the sophisticated nature of head representation, of detailing, and most especially by the well-rationalized defenses against the obviously pathological inability to conceptualize the body-form. Thus, these three sets of drawings would rate highly field-dependent in body-concept, but highly field-independent in other areas of differentiation and sophistication.

While these unratable (U) drug-peak drawings of our most field-independent subjects at T_1 were uniformly assessed as aesthetically most pleasing (note in Table 2 that the first 2 of the 3 subjects obtained identical scores on aesthetic pleasingness for all drawings from the two adjudicators, separated by 7000 miles), the 3 subjects in the other subgroup scored in the opposite direction on every criterion.

The pre-drug and drug-peak drawings of Y.F. (left and right of Figures 1 and 2), illustrate the change from, in Dr. Marlens' words, "most independent, well-differentiated, clearly articulated, sophisticated body-concept" to an unratable (U) body-concept. Nevertheless, these unratable drawings were judged aesthetically most pleasing, although neither Y.F. nor any other of the subjects in this study has been exposed to any formal art training whatsoever. The drug-influence on the handwriting samples of Y.F. in Figure 3 is again manifested as a change from a realistic style to an aesthetically more pleasing one resembling that of

Figures 1 and 2. Male and female figure-drawings produced by Y.F.♀ prior to, i.e., at T_1 (on the left) and at T_2 or the peak of (on the right) a 160 μg/kg psilocybin-induced experience. Note the change from maximum field-independence at T_1 to "unratability" (U) at T_2, as well as the marked increase in aesthetic qualities, *i.e.*, a transformation of "sign" to symbol, from T_1 to T_2 (also see Table 2).

children and primitives. (For a discussion of the significance of handwriting parameters, especially in relation to hallucinogenic drug-induced changes, see Fischer, Kappeler, et al.,[15] and Thatcher, et al.[28])

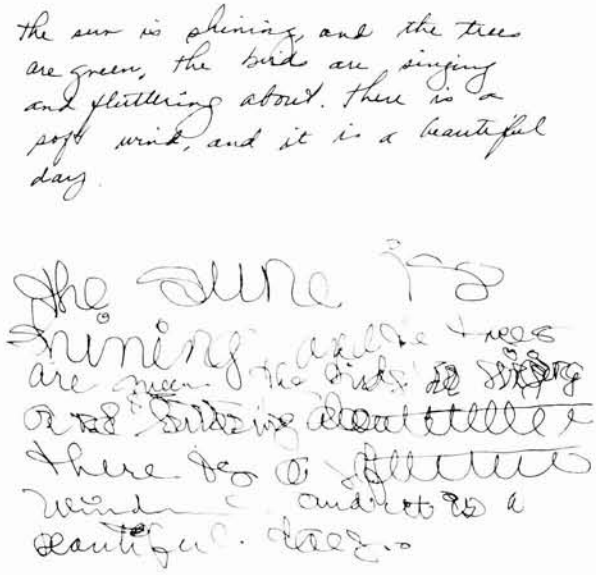
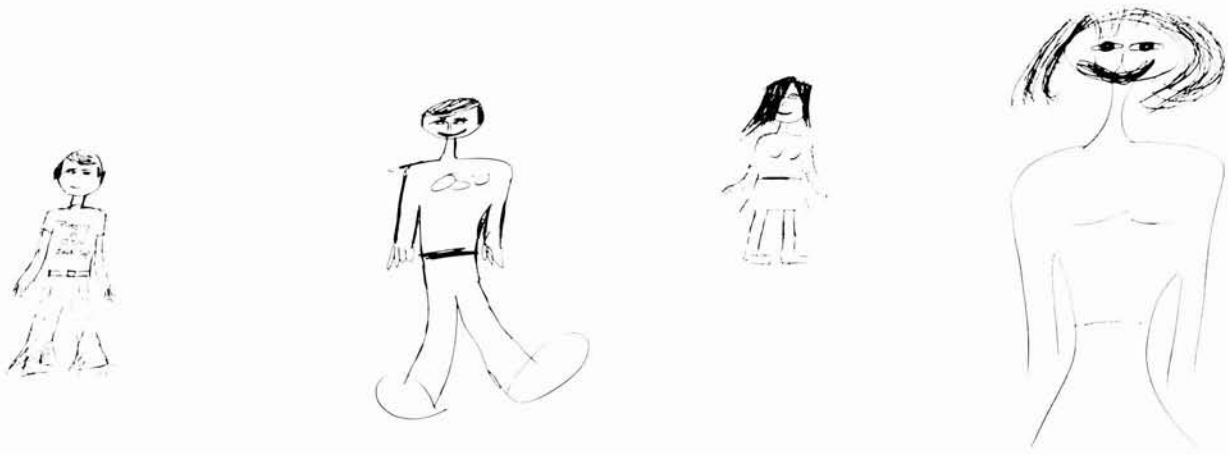


Figure 3. Handwriting sample also produced by Y.F.♀ prior to (above) and at the peak of (below) a 160 μg/kg psilocybin-induced experience. Note again the change from a more conventional handwriting to a childlike calligraphy at drug-peak, (a transformation of signs to symbols) as well as the usual drug-induced increase in handwriting area.

CREATIVE PERFORMANCE VS. CREATIVE EXPERIENCE

We now contrast the aesthetically pleasing drawings and handwriting produced at drug-peak in Figures 1, 2, and 3 by Y.F., representing the most field-independent subgroup, with the aesthetically less-pleasing drawings and handwriting in Figures 4, 5, and 6 by J.W., representing the less field-independent subgroup. It is striking that, although J.W.'s drawings were judged less pleasing, J.W. nevertheless scored highest in "creativity" of all 6 subjects in Table 2 (i.e., his $\Sigma(N+P) = 100$). It is well to remember, however, that MacKinnon's test was devised for the identification and evaluation of *creative performers*, as against what we might call *creative experiencers*. Creative experience leaves no permanent record for public inspection: the fleeting experience is itself the art form. J.W.'s drawings imply that a high MacKinnon creative-performer's score does not reflect the ability to perform aesthetically pleasing drawings under hallucinogenic drug influence. The hallucinogenic drug state of our most field-independent subjects can be regarded as creative *experience* of which the aesthetically pleasing figure-drawings are *records* which *do not* reach the level of creative artistic performance. Thus, the hallucinogenic drug-induced waking-dream state apparently facilitates aesthetically pleasing creative performance in those of our subjects who score *lower* on this *creativity* measure, show greater *field-independence* prior to drug-ingestion, and display a *large standard deviation (S.D.)* on a variety of perceptual and/or behavioral tests. We have found[8,10,12] that a large S.D. reflects an individual's versatility, i.e., wide-ranging perceptual-behavioral or interpretive repertoire, which



Figures 4 and 5. Male and female drawings produced by J.W.♂ prior to, i.e., at T_1 (on the left), and at T_2 or the peak of (on the right) a 160 μg/kg psilocybin-induced experience. Note the change from low field-independence at T_2, as well as the low aesthetic quality of all drawings (also see Table 2).

may be akin to Bloomberg's[2] "mobility." Indeed, when computing a subject's S.D. on the handwriting test,[10,15,28] our most field-independent subjects (see upper half of Table 2) display, on repeated occasions, mean S.D.'s which are practically twice as large as those obtained from the less field-independent subjects (see lower half of Table 2) (the mean S.D.'s of the 2 subgroups, calculated from 88 handwriting-area measurements, are 9.4 and 5.0 respectively).

It has been repeatedly contested that the hallucinogenic drug-induced state may be conducive to creativity. Our distinction between creative experience and creative performance enables us to look at the hallucinogenic drug-induced waking-dream state as a potentially creative experience which, like the sleeping dream state (without drugs), removes one from the stereotyped, structured state of daily routine. In this unstructured state the subject is neither able nor willing to verify his creative hallucinatory (or dream) experience through voluntary motor performance. Verification is possible and meaningful only in the "normal" state of structured perception. The departure from the so-called "normal" state is not, however, the only criterion for creative experience. Our results suggest that a lower (MacKinnon) creative performer's score, a high degree of (Witkin) field-independence, and a wide-ranging perceptual-behavioral or interpretive repertoire —indicated by a large S.D. on a variety of perceptual and/or behavioral tasks—are among the prerequisites of hallucinogenic drug-induced creative experience. These three criteria may point to one and the same essential

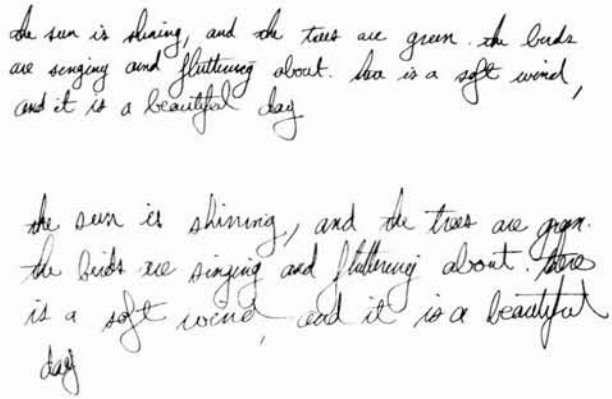


Figure 6. Handwriting sample also produced by J.W.♂ prior to, i.e., at T_1 (above) and at T_2 or the peak of (below) a 160 μg/kg psilocybin-induced experience. Note the usual increase in handwriting area from T_1 to T_2, and lack of significant change in handwriting style.

"talent": an individual's ability to float free of anxiety in a dreamy state and to find symbolic meaning in the ever-changing play of figure-ground relationships.

DISCUSSION

We may wonder about the high incidence in our sample of subjects who had creative experiences during the hallucinogenic drug-induced state (see the 3 subjects in the upper half of Table 2). Recall that our 6 subjects were selected from an unrepresentative sample of the general population, i.e., from volunteers who are predominantly taste-sensitive (Note: Compare this with the Gaussian distribution of taste sensitivity, i.e., taste-thresholds, in a randomly selected population.[14,16]) and thus drug-sensitive MBTI intuitors and introverts with fast "reaction times" in terms of the Serial Seven Test.[11,13] The majority of our volunteers are also frequent dreamers who dream more in color than in black-and-white and prefer color to form.[17] These systemically sensitive subjects, who display an unrepresentatively high Σ(N+P) or MacKinnon creative performer's score, gladly volunteer for hallucinogenic drug research and thus form a sample with a high incidence of potentially creative subjects.

Approximately 2% of hospitalized patients can, usually in the descending branch of an acute psychotic episode, and with the encouragement of a sympathetic art therapist, perform aesthetically pleasing drawings and paintings, even though they may never have previously done so and, barring relapse, may never do so again. If the hallucinogenic drug-induced state and the "natural" acute psychotic episode are, indeed, comparable states of ergotropic arousal,[13] both enabling a subject to leave behind the structured world of daily routine (There is, thus, madness in both methods.), then we can assume that a random sample of volunteers would have also yielded not more than about 2% drug-induced creative experiencers. (Note: Ergotropic arousal denotes, according to Hess,[21] behavior patterns that are preparatory for positive action and characterized by increased sympathetic activity and an activated psychic state. The trophotropic effect, on the other hand, consists of increased parasympathetic discharges, relaxation of the striated muscles, cortical synchronization and sleep.[19])

In trying to apply these findings to the distinction between creative experiencers and creative performers, we further assume that:

(1) The majority of the population, i.e., the 50% lying in the middle range of the Gaussian distribution of (taste-) sensitivity,[11] consists of rather uncreative experiencers for whom dreams or hallucinations are not particularly meaningful.

(2) Those subjects from the most sensitive tail of the Gaussian distribution of systemic sensitivity are creative subjects who may be further divided into two groups: (a) creative experiencers with higher MacKinnon "performer's" scores without drugs, who are unable to produce aesthetically pleasing figure-drawings (i.e., test-records) during the hallucinogenic drug-induced state (in our sample, the 3 subjects in the lower half of Table 2); and (b) creative experiencers with lower MacKinnon "performer's" scores without drugs, who can produce aesthetically pleasing figure-drawings at drug-peak (the 3 subjects in the upper half of Table 2).

(3) Lastly, there is an elite minority who have creative dream and hallucinatory experiences and are creative performers, as well. For these subjects, hallucinatory or dream states are the inspirational source for creative performance in the physical dimension.

Perhaps the art of children, primitives, psychotics, the mentally retarded and *peintres naifs* represent a boundary condition between our categories 2-b and 3. Since it was our own age that first identified these groups as artists, we are unable to assess their "permanent place" in the history of art (values).

Two conflicting claims are usually made about the relation between hallucinogenic drugs and creativity. One group contends that hallucinogenic drugs cannot be conducive to creativity since they impair performance, while the other claims that hallucinogenic drugs bring about an increase in creativity (unspecified). First, it should be pointed out that these questions are only part of a larger topic which covers creativity and hyper-aroused (dream) states in general.[7,9,12] The widely held generalization that hallucinogenic drugs impair performance cannot be maintained, since we have found that certain inter-individual differences may disappear under hallucinogenic drug-induced arousal, while others become manifest only under drug-influence.[29] Hallucinogenic drugs can only enhance existing personality characteristics and therefore the results of a study will depend on the characteristics of the selected subject. Evidently, (taste-) sensitive, intuitive, etc., volunteers with large perceptual-behavioral variability and a field-independent cognitive style will have creative experiences during the hallucinogenic drug-induced state, while a (taste-) insensitive, down-to-earth, field-dependent volunteer with small perceptual-behavioral variability may just get "stoned." Moreover, we have seen that it is useful to distinguish between creative experience and creative performance, since it is apparent that certain subjects may have creative experiences, while only a very few may be able to successfully combine creative experience and creative performance.

A few words should be said about the MPDT-measured "brain-damage" evoked by psilocybin in half of our healthy-looking volunteers, and about the "cure" of "brain-damage" by the drug in the other half of our subjects. Apparently, "brain-damage" is as elusive and difficult to localize in healthy subjects as "creativity." "Brain-damage" tests such as the MPDT or the spatial orientation (map-walking) test of Semmes, et al.,[27] and Weinstein, et al.,[30] all possess a perceptual component.[1] Edwards and Cohen[5] found that in subjects who have ingested LSD at least 50 times, "spatial" orientation has been changed, and that there is an inverse relationship between general intelligence and number of ingestions of LSD and related drugs. It is tempting to draw an analogy between this changed "spatial orientation" (which may be a learned perceptual differnece) and our MPDT-

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