

MESCAL

THE 'DIVINE' PLANT AND ITS
PSYCHOLOGICAL EFFECTS

HEINRICH KLÜVER

Ph D



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MESCAL

*Il y a une espèce d'unité dans la variété qui
me permettra de rédiger sans trop de peine cette
monographie de l'ivresse . . .*

CHARLES BAUDELAIRE,

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MESCAL

THE 'DIVINE' PLANT AND ITS
PSYCHOLOGICAL EFFECTS

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INTRODUCTION

The cult of the *Echinocactus Williamsii* (peyotl; mescal) and the remarkable train of phenomena which follow its ingestion have constituted a most fascinating study for many years. Despite the singularity of the symptoms of mescal intoxication, the drug had remained but little known until the treatises of Rouhier and Beringer in recent years made it familiar to us. This present volume, the work of Dr. Klüver, is, however, the only monograph in English on the subject. Within its pages the author has dealt with the broad aspect of the subject; he has written of the rituals and ceremonies with which the native devotés have surrounded this plant, which indeed they have exalted to divine rank. Klüver also deals shortly with the pharmacological aspect of the crude drug and its constituent alkaloids. The size of the volume, however, has

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precluded any detailed account of these particular aspects, and the author has wisely devoted the bulk of the monograph to the physiological and (more particularly) the psychological standpoints of mescal intoxication and chronic mescalism. This work is therefore something more than a general discussion of mescal in all its features; it is a most valuable contribution to the psychological aspect of the extraordinary hallucinosis which is so characteristically produced by this drug. Within these pages we read for the first time a most careful and detailed analysis of the visual and other phenomena which comprise the *ivresse peyotline*, and we are furthermore given an intimate study of the associated personality changes.

Fortunately rare in this country, mescal addiction is common in the New World, among the Indians of Mexico and even of some of the southern of the United States—particularly Texas and New Mexico. As Klüver points out, there is evidence that increased facilities of transport have in recent years dissemin-

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ated the mescal cult far beyond the original confines. In this country the employment of mescal has been almost entirely restricted to the researches of a few experimental pharmacologists and psychologists, such as Dixon and Havelock Ellis.

Mescal is unique among drugs in that its main action is a stimulant of the visual and visuo-psychic areas of the cortex. Hence the characteristic effects of ingestion take the form of visual hallucinations of varying complexity, and distortions or perversions of visual perception—all of which are most ably described by Klüver. In some instances also, other sensory activities share in the excitation, and alterations in the function of the special senses or bodily feelings may be present.

For the purpose of description one may conveniently divide the visual phenomena of mescalism into: (1) visual hallucinations; (2) alterations in the vividness of visual imagery; and (3) apparent change in the aspect or behaviour of real objects.

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Each of these manifestations is analysed by Klüver and he deals first with the nature and characters of the hallucinations. He describes how various "form-constants" frequently recur—spirals, cones, lattice-work and so on; the factors of colour and illumination are considered. Questions of localization within the visual field, of motility, of symmetry, of dimension and of plurality are investigated. A tantalizing sense of incompleteness often characterizes these visions, and Klüver discusses fully this interesting aspect, which he speaks of as the "presque vu" phenomenon.

Changes in the intensity of visual imagery are of interest in mescal intoxication and the author takes up the question of the influence of thought upon the development and nature of the hallucinations.

The appearance and behaviour of surrounding objects may seem markedly altered during the acute stages of mescalism. Thus Klüver describes megalopsia or micropsia; illusions of movement; the endowment of excessive speed to

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objects actually in motion; the vivid enhancement of detail.

Rarer and less characteristic are the changes in other sense fields—olfactory, auditory or gustatory. Thus we may find hyper- or hypo- sensitivity in these respects, perverted reactions, or actual hallucinations. Of especial interest are the not infrequent occurrence of synaesthesiae in mescal states, whereby excitation of one sense organ by actual stimuli evokes a train of phenomena pertaining to another sense organ. These resulting features may comprise either a particularly well defined mental image or else actual illusory or hallucinatory concepts. Thus we may encounter audito-visual, audito-tactual, visuo-tactual, tactuo-visual and other types of synaesthesia. The first is perhaps the commonest and constitutes one of the varieties of the so-called *audition colorée*. Putt, for example, found during a state of mescal intoxication, that each audible stroke of a pendulum produced an "explosion of colour". Prentiss and Morgan discovered that the beat of a drum had the

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power of increasing the beauty and variety of the visions. One of Rouhier's subjects stated that the sound of the low notes of a piano produced an hallucination of violet, while high notes gave rise to rose and white. The harmonies of a musical composition evoked grandiose architectural visions—"a basilic court with statues". Dixon also may be quoted in this connection: "the effect of the sound of the piano was most curious and delightful, the whole air being filled with music, each note of which seemed to arrange around itself a medley of other notes which appeared to me to be surrounded by a halo of colour pulsating to the music". Many other examples could be cited to illustrate this association between sounds and vision. In this respect one is reminded of the similar synaesthetic effect of *cannabis indica*—so well described by Gautier¹ and by Baudelaire².

¹ "Mon ouïe était prodigieusement développée. J'entendais le bruit des couleurs. Des sons verts, longs, bleus, jaunes m'arrivaient par ondes parfaitement distinctes. Chaque objet effleuré rendait une note d'harmonie ou d'harpe éolienne."

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Synaesthesiae between colour and taste have also been recorded: thus Havelock Ellis described how, on one occasion, a colour (green) took on a sweetish and somewhat metallic taste in his mouth. Blue, in turn, had a taste resembling phosphorus. In respect of these special sense linkages, mesalism resembles the bizarre and barely describable auras and confusional states which may occur in migraine and epilepsy, whereby stimuli from one sense organ are perceived and described in terms of other sense channels, as though short-circuiting processes were at work along unusual transcortical pathways.

From the visions themselves, Klüver passes to an investigation of the so-called "mescal psychoses" and the reaction of the individual himself towards his hallucinosis. As we might expect, these latter are indeed variable. All manner of emotional response may occur—depression, indifference, interest or

“... Les transpositions d'idées les plus inexplicables ont lieu. Les sons ont une couleur, les couleurs ont une musique.”—*Les Paradis Artificiels*.

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euphoria. With larger doses, profound changes in orientation in time and space may occur and dominate the picture; thus Fernberg, who took as much as 39 grains of mescal, had few hallucinatory experiences, but became grossly disorientated in all spheres. Mixed somatopsychic aberrations, ideas of transposition of personality, haptic illusions of infinite variety are among the more fascinating of the diverse aspects of mescal intoxication.

So much for the present status of mescalism; the importance of the drug in the psychological research of tomorrow is admirably sketched by Klüver. It is obvious that in the possession of an agent such as mescal—with so selective an action—we have an instrument which may prove of the greatest value. Possibilities of its employment in research along neurological and ophthalmological fields can only be guessed at, and a use in the investigation of cortical and sub-cortical activity is most suggestive. The therapeutic aspect of the problem is still unknown. Some fifteen

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years ago Maloney reported success from the use of mescal in cases of optic atrophy, but the lack of supporting evidence suggests a non-fulfilment of early promise.

Klüver's contribution to the literature of mescal will do much to bring into greater prominence the properties and possibilities of this most extraordinary drug. It is to be hoped that English investigations will become familiarized with this plant and be encouraged to employ it in the many suggestive and therapeutic, psychological and neurological avenues of research which lie open.

MACDONALD CRITCHLEY.

London,

August, 1928.

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I

“ MESCAL BUTTONS ”

“ As the Semitic mind could conceive, and the Aryan mind could accept the Semitic conception, that deity may be incarnated in an animal body—that is, a human body—so to the American Indian mind it seems just as reasonable to conceive that deity may dwell in a plant body.”

M. R. GILMORE.

The importance of mescal for psychological research cannot be questioned. We shall deal here with the psychological effects of this drug, with special reference to the unusual visual experiences which characteristically result from its use.

“ Mescal buttons ” or “ mescal beans ” are the dried tops cut from several species of the cactus *Lophophorus* (*Anhalonium*), particularly from *L. Williamsii* and *L. Lewinii*. The drug has different names among the Indians using it : e.g. “ hikori,” or “ hikuli ” among the Tarahumaris ; “ huatari ” among the Cora Indians ; “ seni ” among the Kiowas ; and “ wokowi ” among the Comanches.

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“Peyote” is the general commercial term being derived from the Aztec “peyotl” which is the Nahuatl word for “cocoon.” The tops sliced off from the small fleshy spineless cactus bear in the center a mass of whitish hairs in which the small flowers are partly concealed. When dried, these tops become hard and brittle, and shrink to button-shaped discs, one or two inches broad and from an eighth to a quarter of an inch thick. These mushroom-like discs, coming especially from the plants growing in northern Mexico and on both sides of the Rio Grande, are spread among the Indians of the United States under the misleading name “mescal buttons”. This name is misleading because “mescal” may be confused with one of the most common intoxicants in Mexico, the distilled liquor mescal. It would be better to use the word “peyotl” for the drug, a term preferable from the etymological point of view. Nevertheless, we shall use “mescal”, since this term has been employed in almost all scientific English publications on the subject.

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The botany and chemistry of the drug are still a matter of dispute. Whether or not *L. Lewinii* is a variety instead of a distinct species is one of the unsettled questions. Safford maintains that the surface of *L. Lewinii* has usually thirteen ribs, separated by strongly sinuous grooves, but that sometimes there are twelve, or even as few as nine ribs; the typical *L. Williamsii* is supposed to have eight ribs, sometimes as many as ten, separated by straight, or almost straight, lines. On the basis of these observations, Safford inclines to the view that the different types are connected by intermediate forms and that they cannot, therefore, be specifically distinct. All of them may be classified under *L. Williamsii*. Here we note that the specimen which we received as *L. Williamsii* from the National Museum, Washington D.C., through the courtesy of Dr. J. N. Rose, has ten ribs. In general, the botanical investigations concerning the specificity of *L. Lewinii* have not led to any definite results.

The same uncertainty exists with regard

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to the chemistry of the drug. L. Lewin was probably the first who attempted a chemical analysis of mescal. Heffter continued this work and reached the conclusion that morphologically similar plants may differ radically in their chemical constituents. But it seems that there is still much work to be done before this conclusion will be generally accepted. Heffter called the alkaloids found in *L. Lewinii* mescaline, anhalonine, anhalonidine, and lophophorine. Especially mescaline, $C_{11} H_{17} O_3 N$, has been used in experimental studies on the psychological effects of the drug. Instead of pursuing further the discussion of the botanical and chemical questions we may here refer the reader to Rouhier's *Le peyotl* for orientation.

According to Mooney, "a detailed account of the mythology, history and sacred ritual in connection with the mescal would fill a volume." Here a few pages must suffice for the principal historical and ethnographical facts.

In many Indian tribes mescal has become the centre of elaborate religious

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ceremonies. After 1890 the ceremonial use of the drug spread among the Indians as far north as the Sioux and Chippewa and west to the Ute. Shonle believes that in the centuries prior to 1890 "peyote spread at most to only five or six tribes north of the Rio Grande", and that since 1890 it has been carried to some thirty additional tribes, a result which is partly explainable by the fact that postal service and railway travel make the transportation of mescal buttons easy. For many centuries mescal ceremonies were only found among those tribes whose wanderings brought them through or near the Rio Grande valley and the adjacent regions, through the "peyote country". The rapid spread of the "peyote cult" beginning before 1900 represents many features of special interest to the anthropologist. The ceremonies of various tribes differ in characteristic ways. A number of variations are due to the introduction of Christianity. We shall cite here Shonle's description of the ceremonies among the Tarahumare Indians:

"The peyote ceremony of the Tara-

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humare is precluded by a ceremonial pilgrimage to the peyote country for the purpose of securing the plants. The chosen company before starting is purified with copal incense. Although several days are consumed in the journey to the peyote country the men eat nothing until they arrive.

The first act upon arriving among the peyote is to erect a cross before which peyote are placed that they may tell where other peyote grow. Raw peyote plants are then eaten and further work is postponed until the following day, after the intoxication has worn off. Peyote are then gathered with a certain ritual and the company returns home, usually having spent several weeks or a month on the journey. Their return is hailed with songs and a sacrificial feast."

"The peyote ceremony is held in connection with the other tribal dances, but not as an integral part of them. A special patio is cleared of rubbish and swept; logs are brought for the fire and arranged to lie in an east and west direction. Two or three women are appointed

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as assistants to the shaman who is to have charge of the ceremony ; they grind the peyote in the metate before the ceremony, taking care not to lose any of the liquid or the water in which the metate is afterward washed. The dirty brown mixture which results is drunk at the dance."

"When evening comes, the shaman seats himself west of the fire with a male assistant on either side and the women assistants to the north of the fire. A cross is placed to the east of the fire. On a symbol of the world a peyote plant is placed and covered with a hollow gourd which is used by the shaman as a resonator for his rasping stick."

"The order of the ceremony consists of singing by the shaman to the accompaniment of the rasping which continues through the night ; offering of incense to the cross by assistants who wear white blankets and carry rattles of deer-hoofs (this dance follows a line contrary to the motion of the sun and occupies the space between the fire and the cross with a later extension to include the fire) ;

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dancing by the women assistants ; drinking of the peyote by all who are in attendance. The only variation in the procedure comes at daybreak when the people gather near the cross for the healing service. This is accomplished not by the direct use of the peyote, which is, nevertheless, thought to have curative power, but by rasping against the person's head, the slight dust from the rasping being thought efficacious in producing health. After healing the people, the shaman rasps toward the rising sun to waft the peyote spirit home. The ceremony ends with this service and is followed by a feast."

Mooney reports that he saw a twelve year old boy eating six mescal buttons and that twelve to twenty is a common number for adults. He refers to an Indian who took even as many as ninety buttons.

In this connection we may call attention to the fact that many experimenters who took the drug themselves chewed and swallowed either the dry mescal buttons, usually three to seven, or ground the

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buttons to powder and took the powder. Others used a decoction or injected one or several of the alkaloids subcutaneously. Thus Knauer and Maloney administered ·15—·2 grm. of the sulphate of mescaline subcutaneously ; Beringer injected as much as ·6 grm. In the Bibliography will be found reference to the original publications which describe the conditions under which the different experimenters have obtained their results. The literature shows that the conditions under which experimental data on the effect of mescal have been secured are not always comparable in the different experiments. But in spite of differences in the amount and the chemical constituents of the dose as well as in age, sex and general condition, etc., of the subjects, it is possible to give a summary of *typical* mescal effects. We will consider those phenomena which are typical of the psychological effects of the drug ; we are not concerned here with a discussion of the physiological effects. The results concerning the physiological action of mescal have been summarized

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by Rouhier. It has been pointed out that mydriasis is about the only constant symptom found in all subjects and that nausea is reported by a great number of cases. But with regard to other symptoms, no general results have been obtained.

II

MESCAL VISIONS

“Qu'éprouve-t-on? que voit-on? des choses merveilleuses, n'est-ce pas? des spectacles extraordinaires? Est-ce bien beau? et bien terrible? et bien dangereux?”

BAUDELAIRE, *Les Paradis Artificiels*.

It has been known for a long time that “visions” are the most characteristic symptom induced by mescal. But it is only recently that a sufficient number of self-observations have been made to enable us to analyze with any certainty the optical effects of the drug. The data available do not warrant any general conclusions concerning the causative factors of these phenomena; as to the “why” we must rely on future experimental work. Our analysis is only concerned with the “how” of the optical effects. Of special importance in this respect are the studies by Beringer, Rouhier, Knauer and Maloney. Valuable contributions have been made by Dixon,

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Havelock Ellis, Fernberger, Guttmann, W. Jaensch, Weir Mitchell, Serko, Mayer-Gross and Stein, Prentiss and Morgan. Knauer and Maloney experimenting on themselves and on physicians in Kraepelin's clinic made altogether twenty-three experiments. Rouhier refers to five observations, and Beringer to "about 60" trials. Beringer who worked in the Psychiatric Clinic in Heidelberg used chiefly physicians and medical students as subjects. Six of his subjects were women. The 32 observations published by Beringer in 1927 are of outstanding importance. Our analysis has principally to rely on these records and on the results of the few experimental studies available. Before entering into a discussion, it will be well to illustrate certain characteristics of mescal visions as found in the records of different experimenters.

Knauer and Maloney upon injecting .2 grm. of the sulphate of mescaline into the subcutaneous tissue of the forearm obtained four hours after the injection the following report from one of their

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subjects : “ Immediately before my eyes are a vast number of rings, apparently made of extremely fine steel wire, all constantly rotating in the direction of the hands of a clock ; these circles are concentrically arranged, the innermost being infinitely small, almost point like, the outermost being almost a meter and a half in diameter. The spaces between the wires seem brighter than the wires themselves. Now the wires shine like dim silver in parts. Now a beautiful light violet tint has developed in them. As I watch, the center seems to recede into the depth of the room, leaving the periphery stationary, till the whole assumes the form of a deep funnel of wire rings. The light, which was irregularly distributed among the circles, has receded with the center into the apex of the funnel. The center is gradually returning, and, passing the position when all the rings are in the same vertical plane, continues to advance, till a cone forms with its apex toward me.” In the following the subject describes “ beautiful crimsons, purples, violets, blues and

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greens " quickly succeeding one another. The background of this " gorgeous colour panorama was first like faintly illuminated ground glass ; it is now a silvery tint, and is deepening into a yellow like pure gold . . . On pressing upon my eyes, the whole picture seemed to materialize." The wires became " more solid, more real and quite distinct from the background." " The wires are now flattening into bands or ribbons, with a suggestion of transverse striation, and colored a gorgeous ultra-marine blue, which passes in places into an intense sea-green. These bands move rhythmically, in a wavy upward direction suggesting a slow endless procession of small mosaics, ascending the wall in single files. The whole picture has suddenly receded, the centre much more than the sides, and now in a moment, high above me, is a dome of the most beautiful mosaics, a vision of all that is most gorgeous and harmonious in colour. The prevailing tint is blue, but the multitude of shades, each of such wonderful individuality, make me feel that hitherto I have been totally ignorant of what the

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word colour really means. The colour is intensely beautiful, rich, deep, deep, deep, wonderfully deep blue. It is like the blue of the mosque of Omar in Jerusalem . . . The dome has absolutely no discernible pattern. But circles are now developing upon it ; the circles are becoming sharp and elongated . . . now they are rhomboids ; now oblongs ; and now all sorts of curious angles are forming ; and mathematical figures are chasing one another wildly across the roof. The colours are changing rapidly—from blue green to black, to brown—passing successively through an infinite variety of transitional shades . . .”. Six hours after the injection, the subject sees “ a beautiful palace, filled with rare tapestries, pictures, and Louis Quinze furniture . . .”. In the rooms ladies appear “ without motion . . . as a series of portraits . . .”. Twenty hours after the injection there are outlines “ suggesting crocodiles, lizards and other reptiles . . . they arouse absolutely no sensation of fear.” There are “ visions of human intestines, of sections of abdomens, and sections of the pregnant uterus . . .”.

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As a second example of mescal visions we quote from the report of Weir Mitchell who, on the "noon of a busy morning", took $1\frac{1}{2}$ drachm of an extract "of which each drachm represented one mescal button." One hour hereafter, little over a drachm was taken and at about four o'clock half an ounce of this extract in three doses. Soon Mitchell found himself "deliciously at languid ease." At 5.40 he noticed a number of star points and fragments of stained glass with closed eyes. He went into a dark room: "The display which for an enchanted two hours followed was such as I find it hopeless to describe in language which shall convey to others the beauty and splendour of what I saw." "Stars . . . delicate floating films of colour . . . then an abrupt rush of countless points of white light swept across the field of view, as if the unseen millions of the Milky Way were to flow a sparkling river before the eye . . . zigzag lines of very bright colours . . . the wonderful loveliness of swelling clouds of more vivid colours gone before I could name them . . ." Then, for the first

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time, "definite objects associated with colours" appeared. "A white spear of grey stone grew up to huge height, and became a tall, richly finished Gothic tower of very elaborate and definite design, with many rather worn statues standing in the doorways or on stone brackets. As I gazed every projecting angle, cornice, and even the face of the stones at their joinings were by degrees covered or hung with clusters of what seemed to be huge precious stones, but uncut, some being more like masses of transparent fruit. These were green, purple, red, and orange, never clear yellow and never blue. All seemed to possess an interior light, and to give the faintest idea of the perfectly satisfying intensity and purity of these gorgeous colour-fruits is quite beyond my power. All the colours I have ever beheld are dull in comparison to these. As I looked, and it lasted long, the tower became of a fine mouse hue, and everywhere the vast pendant masses of emerald green, ruby reds, and orange began to drip a slow rain of colours." After "an endless display

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of less beautiful marvels I saw that which deeply impressed me. An edge of a huge cliff seemed to project over a gulf of unseen depth. My viewless enchanter set on the brink a huge bird claw of stone. Above, from the stem or leg, hung a fragment of same stuff. This began to unroll and float out to a distance which seemed to me to represent Time as well as immensity of Space. Here were miles of ripped purples, half transparent, and of ineffable beauty. Now and then soft golden clouds floated from these folds, or a great shimmer went over the whole of the rolling purples, and things, like green birds, fell from it, fluttering down into the gulf below. Next, I saw clusters of stones hanging in masses from the claw toes, as it seemed to me miles of them, down far below into the underworld of the black gulf. This was the most distinct of my visions." In his last vision, Mitchell saw the beach of Newport with its rolling waves as "liquid splendours, huge and threatening, of wonderfully pure green, or red or deep purple, once only deep orange, and with no trace

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of foam. These water hills of colour broke on the beach with myriads of lights of the same tint as the wave." Again, the author considers it totally impossible to find words to describe these colours. "They still linger visibly in my memory, and left the feeling that I had seen among them colours unknown to my experience."

William James received a supply of mescal buttons from Mitchell. He tried the drug and reports on the results in a letter to Henry James: "I took one bud three days ago, was violently sick for 24 hours, and had no other symptom whatever except that and the *Katzenjammer* the following day. I will take the visions on trust!" Even Mitchell writes "These shows are expensive . . . The experience, however, was worth one such headache and indigestion, but was not worth a second."

We refer now to our personal observation to demonstrate some other aspects of mescal visions. 23 grm. of the powdered buttons were taken in doses of 13 and 10 grm. Half an hour after taking the second dose vomiting occurred. Soon

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hereafter phenomena of the following kind could be observed with closed eyes :
“ Clouds from left to right through optical field. Tail of a pheasant (in centre of field) turns into bright yellow star ; star into sparks. Moving scintillating screw ; ‘ hundreds ’ of screws. A sequence of rapidly changing objects in agreeable colours. A rotating wheel (diameter about 1 cm.) in the centre of a silvery ground. Suddenly in the wheel a picture of God as represented in old Christian paintings.—Intention to see a homogeneous dark field of vision : red and green shoes appear. Most phenomena much nearer than reading distance.—The upper part of the body of a man, with a pale face and red cheeks, rising slowly from below. The face is unknown to me.—While I am thinking of a friend (visual memory-image) the head of an Indian appears.—Beads in different colours. Colours always changing : red to violet, green to bright gray, etc. Colours so bright that I doubt that the eyes are closed.—Yellow mass like salt-water taffy pierced by two teeth (about

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6 cm. in length).—Silvery water pouring downward, suddenly flowing upward.—Landscape as on Japanese pictures: a picture rather than a real landscape.—Sparks having the appearance of exploding shells turn into strange flowers which remind me of poppies in California.—(Eyes open): streaks of green and violet on the wall. Then a drawing of a head changing into a mushroom (both of natural size). Then a skeleton (natural size) in lateral view turned about 30° to the left. Head and legs are lacking. Try to convince myself that there are only shadows on the wall, but still see the skeleton (as in X-ray).—(Eyes closed). Soft deep darkness with moving wheels and stars in extremely pleasant colours.—Nuns in silver dresses (about 3 cm. height) quickly disappearing.—Collection of bluish ink-bottles with labels.—Red, brownish and violet threads running together in center.—Autumn leaves turning into mescal buttons.—Different forms emitting intense greenish light.—Forms in different colours; contours often dark.—Strange animal (length perhaps 10 cm.) rapidly turns into

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arabesques.—Gold rain falling vertically. On stationary background rotating jewels revolving around a center. Then, with a certain jerk, absence of all motion.—Regular and irregular forms in iridescent colours reminding of radiolaria, sea urchins and shells, etc., in symmetrical or asymmetrical arrangement.—Shells illuminated from within radiating in different colours, moving towards the right, turned about 45° towards the right and somewhat towards me. A little piece in every shell is broken out.—Slow majestic movements along differently shaped curves simultaneous with 'mad' movements.—Feeling there is 'motion *per se*.'—Man in greenish velvet (height about 7-8 cm.) jumping into deep chasm.—Strange animal turns into a piece of wood in horizontal position."

We shall now analyze the visions produced by mescal to determine the typical characteristics of these phenomena. It is hoped that the excerpts cited above will illustrate some of the points now under consideration.

At the very beginning, our search for

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typical effects seems to meet serious difficulties. On the one hand, the investigators emphasize that the phenomena defy all description. On the other hand, the phenomena reported present such striking differences in appearance that it seems more adequate to stress the diversity of these phenomena than the "common elements". As regards the first point, we find—although, as Havelock Ellis puts it, "the chief character of the visions is their indescribability"—that a comparison of those aspects of the visions which have actually been described, yields positive results. Furthermore, we note that, descriptively, "indescribability" refers in most cases to the transitoriness and to certain qualitatively new aspects of the phenomena not previously experienced by the subject in such a way. As regards the second point, it is clear that the extremely variable optical effects found in some cases have to be kept in mind when it comes to statements about "typical" effects. This variability can, as the data show, be only partly explained by reference

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to differences in the chemical properties of the alkaloids employed. Even if kind of extract, dose and method of administering are kept constant, the symptomatic picture varies in certain respects from person to person and in the same person from time to time. In Serko's case for example, in the first experiment the chief symptoms were visions, in the second "haptic hallucinations" and in the third "associative disturbances". Though the visions which are hardly ever absent in the drugged state may in various cases strikingly differ in appearance, it seems safe to predict that future work will hardly add new characteristic variants to those which are known at present, at least not for adults of the white race.

In discussing the typical features of these phenomena we should call attention first to a certain characteristic *sequence* of the visions. Knauer and Maloney consider the following sequence "characteristic of practically all the poisonings": wavy lines; mosaics; carpets, floral designs, ornaments, wood-carving; windmills; monuments; mausoleums; pano-

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ramic landscapes ; statuesque men and animals ; finally scenes picturing episodes in a connected manner. Rouhier attempts to establish four types of mescal visions. He recognizes, however, that they do not correspond to successive stages of the "*ivresse divine*". His belief is that in general these types are "intimately mixed", but that one of these types dominates the others during the mescal state. Geometric figures and kaleidoscopically changing forms are considered characteristic of the first type. Sometimes these forms remind the observer of objects seen in his past life. H. Ellis writes : "The visions never resembled familiar objects ; they were extremely definite, but yet always novel ; they were constantly approaching, and yet constantly eluding, the semblance of known things. I would see thick, glorious fields of jewels, solitary or clustered, sometimes brilliant and sparkling, sometimes with a dull rich glow. Then they would spring up into flowerlike shapes beneath my gaze, and then seem to turn into gorgeous butterfly forms or endless folds of glistening

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iridescent, fibrous wings of wonderful insects . . .". According to Rouhier the second type of visions is represented by familiar objects, landscapes, faces, etc., whereas the visions of the third type, which are supposed to be especially characteristic of mescal, cannot be traced back to events of the past. Monstrous forms, fabulous landscapes, etc., appear. Mitchell's visions are cited for illustration. The phenomena of the fourth type are said to have remarkable similarity with those produced by hashish. It seems to us that any scheme which, in a detailed manner, assigns different kinds of visions to successive stages of the mescal state must be viewed as extremely arbitrary. The only thing that is typical with regard to sequence is that very elementary visions are followed by visions of a more complex character. In general, the phenomena observed first are seen by pressing upon the eyeballs. Thereafter, visions appear with closed eyes without such stimulation. Then, they may be seen with open eyes in the dark room and even in broad daylight. It is

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to be noted, however, that in some cases pressure on the eyeballs is entirely ineffective.

The initial phase of the visions as observed with closed eyes may be illustrated by some excerpts from the records: "Clouds from left to right through optical field" (14¹); "the appearance of visions with closed eyes was very gradual. At first there was merely a vague play of light and shade which suggested pictures, but never made them" (1); "when I had the eyes closed, it became brighter and brighter around me . . . this brightness which possessed depth . . . increased more and more and was finally so impressive that, in spite of my being in the dark room and knowing that my eyes were closed, my critical attitude surrendered to this sensuous vividness and I opened my eyes expecting as a matter of fact to sit in a bright room. I found that the brightness impression lasted. I turned around to find the source of light. It seemed very strange that it was bright

¹ The numbers in parentheses refer to the numbers in the Bibliography.

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but that I could not see anything" (13).

Such elementary brightness and colour visions are succeeded by forms and form combinations for which frequently the same descriptive terms are used by different observers. We hear for example, that the forms and designs are in general of "the same character as the images of the kaleidoscope, symmetrical groupings of spiked objects . . . glorious fields of jewels . . . living arabesques . . ." (1). We hear of "a steel veil the meshes of which are constantly changing in size and form . . . beads in different colors . . . red, brownish and violet threads running together in center . . . gold rain falling vertically . . . regular and irregular forms in iridescent colours reminding of radiolaria, sea urchins, and shells . . ." (14); "transparent oriental rugs, but infinitely small" seen for example on the surface of the soup at lunch time or with closed eyes (13); "plastic spherical filigreed *objets d'art* similar to Haeckel's radiolaria . . ."; "wallpaper designs . . ."; "countless rugs . . . with such magnificent hues and such singular brilliancy

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that I cannot even imagine them now . . ."; "the design was not an ordinary chessboard design any more, but the chessboard motive repeated itself, the design became increasingly delicate, the details assumed the character of ornaments . . ."; "cobweb-like figures or concentric circles and squares . . ."; "in the four squares of a coordinate system, I saw moving bands . . . finally in the center there remained a female shape as if cut out of ivory . . ."; "the pyramid of the tower of a Gothic dome . . . architectural forms, buttresses, rosettes, leaf-work, fretwork, and circular patterns . . ."; "modern cubistic patterns . . ."; "swastika forms from the points of which radiate innumerable lines in the forms of screws and spirals, in flashes and calm curves . . ."; "a kaleidoscopic play of ornaments, patterns, crystals, and prisms which creates the impression of a never-ending uniformity" (13).

So far the analysis of the records published has yielded a number of forms and form elements which must be considered typical for mescal visions. No

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matter how strong the inter—and intraindividual differences may be, the records are remarkably uniform as to the appearance of the above described forms and configurations. We may call them *form-constants* implying that a certain number of them appear in almost all mescal visions and that many “atypical” visions are upon close examination nothing but variations of these form-constants.

Some of these constants require a special consideration on account of their possible bearing on the origin of the visionary phenomena. One of these form-constants for example is always referred to by terms such as *grating*, *lattice*, *fretwork*, *filigree*, *honeycomb*, or *chessboard-design*. To quote different observers: “Soon there grew up an extremely beautiful architecture before my eyes. Hexagonal small honeycombs hung down from the ceiling . . .”; “stripes which formed a sort of fretwork . . .”; “somewhat later I saw shadow-like gratings . . .”; “incessant play of filigreed colours . . .”; “in the face of B. I saw a lattice of yellow-greenish horizontal stripes . . .”; “ornamental

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fretwork" (13). Here we mention the fact that one of Beringer's subjects, a physician, sees constantly a fretwork difficult to describe which becomes of central importance in the psychotic state induced by mescal: "I am fretwork; I hear what I am seeing; I think what I am smelling; everything is fretwork . . . I am music, I am climbing in music; I am a touching fretwork; everything is the same." The large number of variations of the fretwork-constant must be kept in mind when it comes to relating these visionary fretwork structures to observations on similar structures reported upon in the field of sensory physiology, e.g. by König and Helmholtz.

Closely related to the form-constant just discussed is the *cobweb* figure. The following excerpts taken from the records of different observers illustrate this phenomenon: "Coloured threads running together in a revolving center, the whole similar to a cobweb" (14); "immense areas over which gigantic cobwebs were spread . . ."; "cobweb-like forms . . ." (13). In one case the subject was looking

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at an acacia standing before the window :
“ Very much to my surprise the leaves of a small branch suddenly appeared in an ornamental pattern as though joined in a circular design having the form of about a cobweb. I looked at other branches, and, looking at them, all leaves assumed the same lattice-like arrangement ” (13).

A second form-constant which deserves special mention is designated by terms as *tunnel*, *funnel*, *alley*, *cone* or *vessel*. To illustrate : “ Sometimes I seemed to be gazing into a vast hollow revolving vessel, on whose polished concave mother-of-pearl surface the hues were swiftly changing ” (1) ; “ the field of vision is similar to the interior of a cone the vertex of which is lying in the centre of the field directly before the eyes (or vice versa) ” (14) ; “ vision of a tunnel in copper-brown colour . . . lines seem to converge in the infinite ” ; “ a large black corridor seen in extremely deep perspective ” (15) ; “ upon pressure on the closed eyes I saw first an alley in very deep perspective ” ; “ deep beautiful perspectives . . .

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growing into the infinite . . . ”; “in deep perspective a suite of oriental rooms ”; “extending away from me a long narrow corridor . . . often looking into cupolas which widen more and more . . . the cupola became increasingly deeper, more funnel-shaped, narrower ”; “I was standing in a very long and wide tunnel ”; “long narrow funnels . . . the ends of which appear in the distance as brilliant points . . . their walls and the perspective effects are in most cases formed by small parallel lines . . . ”; “a large cylindrical hall ”; “the designs occupied the wall of a colossal cone ”; “the pyramid changes into a luminous cone ” (13). The large number of what may be called architectural variations of the funnel-shape is of special interest.

A third important form-constant is the *spiral*. “Upon rhythmical whistling there appears a brown spiral, a wide band, revolving madly around its vertical axis. The band spiral opens and closes as a concertina according to the rhythm of the whistling whereby bright light falls through the intermediate spaces ”; “a

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procession, coming from the lower right, moved slowly in spiral turns to the upper left"; "wire-like thin black lines in curves and spirals drawn out" (13). In this connection we shall refer to the remarkable experiences of Serko. In his description of "haptic hallucinations" he mentions that he had the sensation as though one of his legs had spiral form. "In the diffusely illuminated visual field a luminous spiral forms itself through the active movement of a stripe. This quickly rotating spiral is moving back and forth in the field. At the same time . . . one of my legs assumes spiral form . . . The luminous spiral and the haptic spiral blend psychologically, that is to say, the same spiral which is optically hallucinated is also haptically experienced. In an hallucinatory way the leg blends haptically with the luminous spiral . . .". A physician, a subject of Beringer, reports: "Before me I see the lower part of my body from the hips down as a large green varnished object which has about the shape of a truncated cone with spiral windings." The same subject

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experiences the sounds of a concertina coagulating in the spiral windings of the body.

From the discussion of the most characteristic form-constants we shall turn to an examination of some of the visual properties of the phenomena. As regards *colour tone* one is struck by the large number of variants in this respect. In general, mescal does not produce a preponderance of certain colours and the exclusion of others. At present it seems impossible to state a general rule concerning hues and their sequence in mescal visions. Referring to our own observation, the result was : " All spectral colours can be observed. There is no indication that certain colours occur more frequently than others. Sometimes approximately complementary colours appear simultaneously or successively." Some observers report that " red " and " green " seem to dominate the initial phases of the visions and that " blue " and " yellow " appear later. Other reports indicate that some colour tones do not appear at all, as e.g. " blue " or " red and green." In some cases,

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black, red, brown, violet or blue dominates the picture. Again, it is reported that the colours succeeding each other are contrast colours. In one report we find the statement: "With open eyes one sees pairs of colours, green-red, blue-yellow or brown-red, floating up and down as balls. These colours may assume the shape of a kitten, a bird or a dainty ladies' shoe." It is apparent that any attempt at formulating a general law becomes futile.

The *brightness* of many visions is so intense as to call forth a blinding sensation. "I was able to press but a short time on my eyes since the brightness of the coloured configurations arising hereafter increased so excessively that I was blinded and felt pain . . ." (13); "a luminous pyramid, about 1 m long; the vertex is a glaring white; concentrating on it, a blinding sensation results" (13). Frequent reference is made to "lightnings", "comets" and "explosions." "Suddenly very intense bright light as if produced by an exploding shrapnel (apparently a few cm. from the eyes).

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Almost simultaneously jerky movement of hand to make sure whether blinders are on" (14).

Some of the above quoted descriptions of mesal visions show clearly that an unusual *saturation* is likewise one of their outstanding features. It seems to be especially this characteristic which leads to the often repeated statement that it is impossible to find words to describe mesal colours. But, in addition, there are many other phenomenal aspects of these colours for which psychology is about to develop technical terms. So far there is a deplorable lack of such terms. What we have in mind here is best illustrated by the observation of Havelock Ellis who was not only impressed "by the brilliance, delicacy, and variety of the colours, but even more by their lovely and various textures—fibrous, woven, polished, glowing, dull, veined, semi-transparent." For a more adequate appreciation of the phenomenology of mesal colours a large number of similar terms could be added from other reports. Here we shall add only the remark of one observer which

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shows that the " texture " of some colours is apparently not worth the *Katzenjammer* : " My visual sense is enriched, but the colours lack ' colour ' ; they are nothing but . . . ' shines ' " (13).

We turn to what the subjects call the *illumination* in and of the field in which the phenomena appear. It is of great theoretical interest that not only the brightness value of the different parts in the visual field may change but that frequently reference is made to an " illumination " of the visionary figures. One of Beringer's subjects reports : " The illumination of the picture seemed to come from an unknown, invisible source of light and was moving now and then, in the form of a stripe, from the left to the right and vice versa, but never from top to bottom . . . ". From other subjects we hear : " Legs of spiders in the upper right of the visual field ; somehow, they seemed to be illuminated from behind, the light coming from afar . . . " ; " a face half human, half animal . . . the eyes and the mouth are extremely bright as if the whole were illuminated by an

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electric bulb . . .” (13). Rouhier’s subjects also refer to invisible sources of light which illuminate the visionary objects.

As regards the distribution of the colours, forms or configurations in the field of vision, most observers emphasize the *symmetry* of the phenomena. The geometric center of the field is often the center around which various patterns are grouped ; frequently it assumes a certain distinctness as to brightness, colour or movement. This tendency to symmetry becomes apparent also in the different shapes and form elements themselves. On account of this symmetry most subjects are particularly struck by any kind of *asymmetry* which may appear : “ There was often a certain incomplete tendency to symmetry . . .” (1) ; “ tapestries with pearl and gold embroideries, pottery, mosaic work, in most cases symmetrical, rarely asymmetrical . . .” ; “ all designs came out of an invisible hole which was situated near the right boundary of the visual field . . .” ; “ vision of irregular fragments . . . these fragments appear

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in the upper visual field to the left" (13). A woman, one of Beringer's subjects, had the feeling that the right half of her face was displaced downwardly. "At the same time there was a veil of faint rainbow colours from top to bottom before my right eye."

With regard to the *localization* of the phenomena the statements of different observers differ widely. In case the eyes are closed, the phenomena are, at least very often during the beginning of the visions, localized at the distance of the visual gray. As soon as the field is filled up with visionary designs and objects difficulties in localizing arise very often. The same uncertainty as to position in space may exist when the eyes are open. Sometimes the phenomena are definitely localized on the walls, on the floor or wherever the subject happens to look. Some subjects feel that they cannot make any definite statement as to position, at least not with respect to some of the phenomena. There are even persons who report that the phenomena are "in the eyes" or "in the head". Or: "It is

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not possible to localize them definitely in space; they seem to me rather near, but floating indefinitely in the air . . ." (13). This shows that the phenomena frequently defy, in G. E. Müller's terminology, an exact egocentric localization; the attempt at localizing them entoptically or even intracranially is undoubtedly often nothing but an expression of the uncertainty of the subjects. Such uncertainty does apparently not exist with regard to relative localization, with respect to the position of objects to each other. In general the visions do not move with the eyes. Sometimes a visionary object seems even to have a definite position in perceived space. "I look in a different direction. After a short time there appear pale, sad looking human faces . . . I look back in the first direction and, frightened for a moment, see the head at the same place" (13).

With respect to *dimensionality* we note that visionary forms may be of two or three dimensions. In some cases, the surfaces of objects are described as

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“reliefs”, the objects as “extremely plastic figures”. Again and again the observers compare the designs and forms with artistic products of the orient. To illustrate: “Then I saw halls and passages very plastically . . . I was able to observe various details; I noticed for instance several times that two vaults were separated by a very sharp edge. On one side of the edge it was extraordinarily bright, on the other side it was shaded . . . I estimated the distance between me and the nearest point of the passage to be $1\frac{1}{2}$ —2 m. . . . I saw the hallucinated room very distinctly and I knew the distance of the different points. I believed that it was possible to seize some of the objects . . . One time I saw a man in natural size in the background . . . He performed certain movements but first I could not see what he did . . . I could see the face of this man so clearly that I would recognize him for instance on a photograph. The man stood in the most distant part of the room at a distance of about 8-10 m.”; “the plastic, distinctly visible oriental room . . . I did

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not find any difference between seeing it and the viewing of objectively existent surroundings . . ."; "the meadow was perhaps at a distance of 100 paces . . . in the foreground, at a distance of 8 m., I saw huge wooden snails, a horse-whip for children with a red ribbon and similar things . . . I saw every grass blade; it was clear to me that every blade had to stand just where it did, to bend itself just the way it did and to cast such a small shadow . . ." (13). The last observation is made with open eyes in the dark room. Very frequently, the subjects point out that there are different backgrounds behind each other. Some of them may disappear, others may remain stationary. Occasionally, there is a sudden transition from blurred drawings to distinct perspective. In general, constant change seems to be more typical of the initial stages of the mescal "intoxication". The accounts refer to "furious succession" of colours, to "mad" movements and rotations and to "motion *per se*." At the climax of the intoxication, however, visionary forms, such as human and

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animal faces, monsters, and architectural details can be viewed comfortably. The following is observed with open eyes in twilight: "Then there appears a colourful pig in the upper corner of the room as a large suspended marionette, the long snout which alternately shortens and protrudes is distinctly visible . . . behind the ears of the pig is a wooden figure with red trousers whose night-cap is indistinctly continuous with the wire of the marionette . . . while looking at this figure the pale face of a girl with a red shawl . . . appears . . . I see her very distinctly . . ." (13). Certain visions are of such solidity that they do not disappear or become indistinct upon the appearance of objective light. "The eyes open, the hall—and vault—pictures dominated in the dark room. A cigarette placed into them did not interfere with the observation, but was seen as a foreign light in the hallucinated room. One of the columns for example was always behind the cigarette which was moved back and forth; a column, actually standing in the room, was about one meter to the right

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from the hallucinated column when the light (of the cigarette) appeared " (13).

In considering the *size* of the visionary objects we find that they vary from "gigantic" domes to "lilliputian" figures. Personally with closed eyes we did not see any form the dimensions of which exceeded 10 cm. The squares seen in one of our designs were 2×2 cm.; their size did not seem to change upon opening the eyes. Many observers report macropsia and micropsia. There may be dysmorphopsia of figures with which the subject is familiar on the basis of past experience. Changes in the apparent size of the same figure also occur.

Here we may raise the question whether or not it is possible to *influence visions* by "thinking" or to cause the appearance of new visionary objects by imaginal processes. Most subjects apparently do not manage, in any of the phases of the intoxication, to influence the visions; some succeed to a certain extent, but only a few are able to "see" objects upon thinking of them intently. It is to be noted that most observers state that

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visions and visual memory-images exist independently. The investigation of Knauer and Maloney brought out that visual images could be "controlled, changed and recalled as in normal life, but not with the same facility." But this does not seem to hold in all cases since along with an increase in the vividness of memory-images some individuals discover a greater facility in "controlling" them. On the other hand, it may even be entirely impossible to call up certain visual images. Some of the facts just mentioned are illustrated in the following: "The wish to 'see' the buildings . . . in Brussels could not be realized. I noticed, however, that my imaginative faculties were qualitatively and quantitatively increased" (13); after a picture had been placed on a background and then removed "I tried to see the picture with open eyes. In no case was I successful; only visionary phenomena covered the ground" (14); the subject while watching the vision of a danseuse on a stage attempted "to picture a shoe. He repeated to himself all the separate parts

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of a shoe, and endeavoured by concentration to bring up an hallucinatory image of a shoe. The danseuse continued to dance undisturbed for some time, and then suddenly and unexpectedly there appeared a gigantic mis-shapen shoe seemingly moulded in plaster, and coloured green" (3); "Dr. B. named different persons and pictures which I was to imagine. Soon, thereafter, they appeared to stand in perceived space, well-defined and plastic; some of them appeared on the projection background in the most minute details; some persons as e.g. my parents seemed to be in natural size before me . . ." (13); another subject tries to "see" roses and notices "after about half a minute scintillating dark red points, very difficult to fixate, in addition green spots; the whole a sort of wallpaper design as one would expect to find in the room of a flapper; the red spots grow, the central parts seem to assume the shape of leaves; they become similar to roses, the whole not very distinct"; "it is certain that I can imagine any object I please to in a more concrete way than

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usual, but I am not under the impression that I really see it . . ."; "I tried to force myself to imagine Michelangelo's 'Evening' and 'Morning' but I did not succeed" (13).

Of considerable interest is the fact that sometimes a visionary object appears first singly and, thereafter, as multiple. Such instances of *polyopia* in visions seem to be rather frequent. They represent an interesting parallel to the multiple seeing of real objects with open eyes while in the mescal state and to the polyopia in eidetic and basedoid persons. "A small wooden face appears, it has the form of a small apple; then there comes a small yellow face; suddenly there are three, four faces in one row; above it new rows appear . . ."; "there are animals in frantic motion, I see a crow and a black cat racing on, and behind them five, six animals of the same kind . . ."; "suddenly a little man is standing there changing continually in appearance, sometimes he has a beard, sometimes not, the covering of his head is also changing . . . now the little men increase again in number until

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there is a whole line of them . . . one of them twirls his moustache, and at once all of them twirl their moustaches with a tremendous speed . . .” ; “ I saw a huge black organ with bright metal pipes, at the top they became increasingly smaller. At first the organ was stationary ; then out of the upper pipes there developed smaller and smaller pipes moving upwards continually followed by new pipes. The motion was rather slow, and I was able to observe the rise of pipes very distinctly . . .” (13) ; “ moving scintillating screw ; ‘ hundreds ’ of screws . . .” (14) ; “ open the eyes for a few seconds, look at the experimenter and close them : positive after-image of the face of the experimenter. His hair turns into hair of a cat, his eyes get a bright yellowish colour. Then the head of a cat (natural size) ; hereafter the whole field filled with yellow eyes ” (14).

In this connection we should like to refer to an instance of multiple vision observed by the Indian “ Crashing Thunder ” whose autobiography has been edited by Paul Radin. “ It was now late

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at night. I had eaten a lot of peyote and felt rather tired . . . As I looked again I saw a flag. I looked more carefully and saw the house full of flags. They had the most beautiful marks on them."

In discussing the chief characteristics of mescal visions attention should be called to some hitherto insufficiently analyzed visual "experiences" in the mescal state. The first of these experiences which we propose to call the *presque vu*—experience arises in the following way: the phenomena and events in the visual field point in a certain direction; that means, they suggest an end which is not quite reached, or they lack the proper completion; they do not—to use a *Gestalt* psychological term—call forth a "closure"—experience. A form, a movement, a pattern, etc., is almost complete, but since it never becomes entirely completed, a very characteristic *presque vu*—experience arises. The contour of a figure is almost complete, but it never is quite; a movement or a form element suggests a connection between two shapes or patterns, but this connection is never quite estab-

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lished; a pattern lacks a certain element which is "outside" of the field of vision, this element is almost in view but the final and satisfying completion never takes place due to the "extracampine" location of the missing element. In such cases the optical basis for the *presque vu*—experience is obvious; the fact that during a "mescal psychosis" a special, or even "cosmic", meaning is attached to this visual experience is a different matter. In some cases the subject does not know the exact visual basis for his *presque vu*—experience: "In centre bright light as coming from an electric bulb. Bulb seems to be incomplete. Then brilliant bluish form running through the field; seems to be incomplete in a certain way. In both cases unable to state what is lacking and how the impression of incompleteness arises . . ." (14).

We call the second experience the *dual system*—experience. Sometimes the visual phenomena and events observed fall into two groups. The hues, shapes, designs and movements, etc., in one group

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seem radically different from those of the other group. Thus the observer has the feeling of viewing two "systems" or even two "antagonistic" systems as he may refer to them e.g. as "solar" or "polar" systems. Frantic motion may be typical of one system while slow majestic movements are characteristic of the other one. In psychotic states these two systems the differences of which are merely differences in visual properties may gain "cosmic significance". One of Beringer's subjects reports: "The moment came nearer when the two polar systems could vibrate in tune, when their centers could be united for the formation of an enormous structure. Then I should be able to see everything, no limits would exist for experience and understanding. A disgusting trismus destroyed this moment of maximal tension . . . Again and again they came, again the strong mental tension, the desire to see a solution, and again, in the most critical moment, the painful trismus . . . The forms came again fighting with each other. In concentric circles, from within Gothic forms, from without

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Romanesque forms. Rejoicing more and more, becoming bolder and bolder, the Gothic forms intruded the Romanesque arches and pressed them together. And again, shortly before the decision, the trismus."

III

CHANGES IN DIFFERENT SENSE FIELDS

"Il est temps de laisser de côté toute cette jonglerie. . . ."

BAUDELAIRE.

From the analysis of visions we shall turn to an examination of the changes brought about by mescal in the different sense fields. Especially the changes in *visual sensation* and *perception* deserve a detailed consideration. Most investigators have been more interested in the vision-producing effects of mescal than in the sensory changes caused by the drug. But an analysis of only the visions would leave our account of the optical effects incomplete. Not only would it be incomplete but at the same time we should not arrive at a proper understanding of the way the visual world appears to the subjects. The visionary world and the objective world, observed at the same time with open eyes, are phenomenally not as discrepant as one would expect. Even if

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visions are not seen with open eyes, the *Sehdinge* of the objective world may undergo certain characteristic changes. Only a few investigators have attempted to determine the nature of these changes experimentally.

In examining the results, one is struck by the great variability in the changes produced. These perceptual changes may differ from case to case, from one intoxication to the other, and in different stages of the same intoxication. With respect to colours, there are frequently changes in brightness and saturation, especially noticeable in peripheral vision. Sometimes the colours are brighter and more deeply saturated than usual ; sometimes certain hues objectively present seem to disappear, " everything appears green-blue or green-red, I see nothing but red and green in the world, and I am looking for blue and yellow." It may even happen that " the whole room appears uniformly gray and colourless ". Very often the objects seem to lose their solidity, especially upon looking at them for a while. In other words, the colours change from

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“ surface ” colours (Oberflächenfarben) in the sense of Katz to “ film ” colours (Flächenfarben). In some cases, however, the objects appear more solid than ever, the surface colours are more sharply defined, there is an increase in brightness. Occasionally, the objects are surrounded by halos of one or several colours. In some cases, it is difficult to say whether there is merely a change in the perception of the object or whether we have what may be called a “ visionary transformation ” of the object. The following two observations are made by a physician: “ I notice that brown stripes are coming gradually out of my fingers. Moving my hands, the stripes move just like burnt soft cords ; it is possible to bring the hand with the cords near to my face and move it back thus putting the hand into the cords . . . ” ; “ suddenly the contours of the objects are surrounded by a light blue, hazy halo, this is especially noticeable on the hair of a colleague . . . ” (13). Rapid colour changes on a real object may occur : “ Dr. L. gleamed alternately in violet, yellow, and white light ”.

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Small differences in the hue and brightness of real objects are often noticed. Whether or not mescal actually produces a change in differential sensitivity cannot be answered at present. The experimental investigation of this problem is confronted with a number of serious difficulties which will not be discussed here at length ; but it is a fact that most observers report a hypersensitivity concerning colours. It is not clear whether this implies a lowering of the thresholds or is indicative of changes in so-called " optical attention ". Furthermore we must not overlook that there are reports indicating visual hypsensitivity during the mescal state.

An enhancement of contrast phenomena seems to be the rule. Very pronounced simultaneous contrast is found ; the contours of the objects become sharp and well-defined. Of special theoretical importance are the data on the behaviour of after-images. Referring to our own observation we found that, while fixating a stimulus object, e.g. a paper—square, in order to produce an after-image, the

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background which consisted of one of Hering's gray papers was most of the time covered with ever-changing designs. The stimulus object was also covered with varying forms and colours. Now and then, the phenomena on the background appeared in the complementary colour of the square which we were fixating. Sometimes we could observe the normal marginal contrast, but it was more pronounced than usual. The hues of the after-images obtained did not differ from those seen under normal conditions. In some instances, the visions prevented the appearance of after-images entirely ; in most cases a sharply outlined normal after-image appeared for a while. Then the after-image became a part of the visionary design. Measurements of the size of after-images under various conditions did not reveal anything exceptional. While the visionary phenomena were stationary, the after-images moved with the eyes.

Mayer-Gross and Stein assert that phases in which after-images cannot be produced alternate with phases in which

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the after-image is unusually strong and lasts longer than usual. Such phasic differences, then, would mean that periods in which the peripheral stimulation is ineffective or almost ineffective are followed by periods in which peripheral stimuli call forth an excessive response. It would be of considerable importance if future work could substantiate such different phases. In the meantime, we note that Mayer-Gross and Stein found them in "almost" all subjects; in other words, the existence of individual differences is admitted. Such individual differences must be also assumed when the question is asked: How do mesal visions and peripheral after-images differ in phenomenal appearance? Observing visions and after-images simultaneously, we found that they did not differ phenomenally. A violet after-image seen e.g. in the midst of a visionary phenomenon turned rapidly into a violet circle which "exploded" into small "stars" which immediately fitted into the visionary design. If in this case one were not to know about the peripheral origin of the

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violet square, one would consider it a part of the visions. At the same time, we discovered that upon the attempt to touch the gray background, on which the phenomena were observed the finger came into contact with the paper about 20 cm. before the paper. Throughout the observation this paper assumed a cloudy appearance and seemed to "pulsate". In general, in our case visionary phenomena, after-images and real objects were strikingly similar in phenomenological respect. It may be inferred from the above analysis of the visions that this cannot hold in all cases. There are marked differences in the *Erscheinungsweise* of the visions, and in some individuals or in certain phases of the intoxication after-images and visions differ considerably in appearance. Knauer and Maloney found that the peripheral after-images were "much more material and real than the most vivid of the hallucinations produced by the mescaline" and that they were easily distinguishable from the hallucinations. At the same time they report that for some

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of the subjects the objective character of the visions was so "intense" as to confer upon the vision the "suspicion of real existence", which apparently means that at least in some cases the after-images were not much more material and real than visions. That the after-images finally merge with the visions is reported by the majority of subjects. Knauer and Maloney although considering visions and after-images as phenomenally dissimilar remark that "no matter how distinct and how dissimilar the hallucinations and the after-images originally were, their ultimate fusion produced an harmonious hallucination." In our observation, such an ultimate fusion took place with open as well as closed eyes, for negative as well as for positive after-images. It is to be noted that the sudden and unexpected appearance of unusually strong after-images, not intently produced during the mescal state, may arouse a slight shock in some individuals.

In connection with after-images the following observation is of interest. Before the visual effects of the drug became

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manifest " one of the investigated persons . . . carefully studied a map of a region known to him. Among his first hallucinations was a reproduction of this map, in its most minute details ; but, in addition to all the details of the map, a town which was actually omitted in the map appeared in its proper position in his hallucinatory representation of the map " (3). We are reminded here of the phenomena of *Sinnengedächtnis* which under certain conditions are observed in everyday life. Here a stimulus object is not only reproduced in all its details, but it is also amplified in a certain way. In other cases, the visionary representation of the object is exact, but certain elements are missing.

Objects normally seen in two dimensions may appear tridimensional in the mescal state. Tridimensional objects may seem still more voluminous than usual. One of the subjects has to discontinue reading in a paper since the shadows of minute folds on the surface of the paper hardly perceptible to the normal eye are too disturbing. The same subject speaks

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of a general "plasticity—experience." "In such a way, all objects, even the smallest and most unimportant ones, appeared to me massive and as if special emphasis was laid on them intentionally . . . this 'plasticity—experience' was extremely pleasant and it led me to seek for more and more pleasure in plastic and solid things . . . a red paper-square seemed to be a piece of red velvet . . . a whitish gray, rather dirty curtain seemed to be made of cement. This perception was not interfered with by the fact that the 'cement-curtain' was easily moved by the wind. On the contrary, I felt an indescribable joy in seeing such a massive thing moving . . . the design in the white table-cloth was also set-off from the ground which was sort of grayish . . ." (13). Newspapers, pictures, floors, etc., may assume the appearance of relief maps, there may be an increase in the solidity of the furniture and the houses. Looking at a picture representing Naples, one of the subjects finds it "so plastic and life-like" that he believes himself on the beach of Naples. In such

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a way, there develops a "hyperplastic seeing as in the stereoscope". Human faces seem to undergo certain changes; they become more "expressive", the features become more sharply defined. "The wrinkles seemed to deepen, the shadows to become clearer and more coloured; the yellowish-green reflection of the wallpaper led to a tired and cadaverous expression. At the same time, the faces seemed to be more characteristic in their expressions". Some subjects feel that their ability to infer certain traits of personality from facial expressions becomes increased.

The changes in the apparent size of real objects require special consideration. To illustrate: "When I moved my hand towards me, it got enormous and bulky forms" . . . ; "I looked out of the window and was particularly surprised at the changes in the size of the houses . . . they seemed to have grown after the fashion of skyscrapers . . ." ; "the bread I held in my hand did not become smaller . . . what I bit off on one end, grew again on the other . . ." ; "as regards

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the cutlets and afterwards the cake, I try to determine which the larger piece is, but I do not succeed. I am sure that they are of unequal size, but after every decision it is clearly the other one which is larger . . ."; "the branches (of a tree) became longer and shorter"; "while looking e.g. at the shingler on the roof, he seems to shrink and to grow"; "a special treat was the way Dr. B. was eating, I saw how he opened his mouth wide and how an enormous appearing potato disappeared in this enormous looking mouth . . . the mouth and the potato did not appear in larger size, but there was somehow the expression of enormous size in a way now inexplicable to me . . ." (13). In this connection, we may cite the following observation: "The two experimenters seemed to sit far off from me . . . but there was no diminution in size" (13). But: "One time I saw that an object at a distance of about $\frac{1}{2}$ m. below my face turned suddenly smaller and receded as if it disappeared in endless depth" (13). We may add a few other cases in which a

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decrease in size is observed. " All of a sudden I noticed that the letters in the book became smaller. At the same time I did not have the impression that this sensation was somehow caused by an increase in the distance between the book and my eyes " ; " in the experiments on after-images I found that the objective pictures presented to me became smaller when moved towards or away from me ; they grew the smaller, the faster they were moved. As soon as the stimulus object was standing still, it seemed to assume its normal size " (13).

In most of these cases the object did not lose its normal proportions. The changes reported are rather complex. There may be e.g. an alteration between macropsia and micropsia or a suddenly developing macropsia or micropsia. In addition we may have changes in the perception of distance and movement. Of unusual interest are observations in which in spite of macropsia (or micropsia) the object does not change its size according to the observer. This seems paradox, but Pick and others have called

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attention to similar phenomena in pathology. We have obtained reports of this kind from eidetic individuals.¹ The subject above referred to sees a potato of enormous size disappear in the enormous mouth of Dr. B., and yet mouth and potato had "normal size". Such observations cannot be dismissed by saying that the impression of "enormousness" has a non-optical foundation. This may be the case in some instances, but there are too many observations in which the subject considers it as the most adequate description to say that he "sees" an enlarged object and yet, at the same time, experiences no increase in size. Further analysis has to bring out more clearly the components of this phenomenon.

Some of the excerpts quoted above indicate that the perception of movement is also abnormally changed. On the one hand, actually performed movements may be perceived in an abnormal way, on the other hand, stationary objects may

¹ Cf. a review of the eidetic literature in *Psychol. Bull.* 1928, 25. H. Klüver: Studies on the eidetic type and on eidetic imagery.

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perform apparent movements. As regards the first possibility we find e.g. that a person walking through the room is perceived successively at different places or that a person walking downstairs is only seen at three different places of the staircase. Thus the continuous movement of an object is inferred from the successive appearance of this object at different places. A person moving his hand to his face may see it at the beginning and at the end of the movement. Moving clouds may appear successively at different places. Under certain conditions, the moving object appears simultaneously at different places. Some excerpts from the Heidelberg records illustrate this phenomenon: "The perception of a moved burning cigarette was a great surprise to me. Not a continuous line or circle as seen under normal conditions in the dark room, but a number of small glowing balls. At the end of the movement I could still see the entire movement as if it were fixed by a number of glowing balls standing in the air. Then these balls jumped all of a sudden in a great hurry

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into the glowing end of the cigarette, but always along the path taken by the cigarette. They did not fade, but all of them went along the curve to the terminal point just as if they were connected by a rubber band. Everything was so distinct that I was able to count the glowing balls; one time I counted 16; there was no luminous line between the glowing balls; it was dark . . . the faster the movement, the more a transition from balls into lines and a decrease in the distance from each other". Another subject reports: "I perceived that luminous points appeared successively, about 12—15. The single points were never connected with each other during the movement . . . Moreover, the lights which were successively seen appeared immediately hereafter simultaneously. The simultaneous impression was the strongest". Another person watching the cigarette sees a large number of bright spots flowing into each other. Still another person sees a continuous luminous line the different places of which differ in brightness. A subject to whom on the preceding day Werthei-

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mer's experiment on apparent movement had been demonstrated was able to see the phi-phenomenon under normal conditions very clearly. In the mescal state, the successive exposure of two luminous lines did not elicit a perception of movement.

The various kinds of abnormal movements described in these reports are not found in all persons or in all phases of the intoxication. The results produced by mescal in this respect are not uniform. As a matter of fact, many individuals see movement as a continuous whole. But such a continuous movement may be "abnormally slow" and an increase in speed may lead to "jerky", "strange" "automatic" or "peristaltic" movements. A further increase, then, will do away with the continuity and lead to seeing the object successively or simultaneously at different places. In other words, there are cases in which the perception of movement varies with the speed of the object. We hasten to add that there are cases in which this does not hold at all. We should add, furthermore, that there

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are observers who report excessively fast movements. Upon the experimenter's moving a cigarette in the dark room, the subject perceives this movement e.g. "as desperately fast, as fast as it cannot be performed by any human being". Or: "When Dr. B. showed me his watch, I saw the ring (of the chain) in frantic motion which continued for such a long time as if it would never stop".

There is no doubt that an experimental analysis of the perception of movements in the mescal state will lead to very important results. Even though quantitative data are not at hand the above cited observations are extremely interesting not only on account of their bearing on the theory of perception, but also in the light of results obtained on pathological cases. Here Best, Pötzl and Redlich, Gelb and Goldstein have made some important contributions. Thus a patient of Gelb and Goldstein saw the handle of a stopwatch or a moving light successively at different places. The same patient was unable to perceive stroboscopic movement. He could not see the

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continuous movement of a rod passing over his skin although he was able to identify the tactual impression.

We shall turn to a consideration of the apparent movement of stationary objects. Phenomenally, such movements may differ considerably. There are jerky and undulating movements; there are movements which change the contours and dimensions of the object, and movements which leave them unaltered but displace the object as a whole. A package of cigarettes moves suddenly with a jerk, or the surface of the walls and the ceiling seems to move back and forth. It is not surprising that the occurrence of certain apparent movements impresses the subject deeply. "I saw that the scales of the fish as well as the fish itself were distinctly moving, I was unable to eat it. I admired the certainty with which Dr. B. was convinced of the death of the fish. The noodles behaved literally and without exaggeration as a moving heap of worms" (13). The same subject tells us that in the moment a bird was about to fly from a

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window sill, the sill protruded, that the floor-stones of the corridor seemed to contract and to expand ; trees, plates, and especially objects with designs appeared to be in constant motion. Another individual reading in a book sees the letters in rapid motion from the left to the right. " Then the letters moved also in the opposite direction, then against each other, constantly changing form and size " (13).

Changes in position of objects due to apparent movements are frequently accompanied by changes in size, colour, tone, brightness, etc. It is very difficult to single out those factors which principally determine the appearance of objects under such circumstances. The changes are very complex, the " normal " appearance is extremely modified. " I am sitting before a shelf which is attached to the wall and on which there are several bottles, empty glasses and small test tubes. The shelf has not its normal shape ; the boards are curved as if they were made of caoutchouc, the whole shelf becomes alternately higher and

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lower ; soon it is leaning towards me, soon it retreats to the wall. Other objects in the field of vision take part in these movements. The bottles also behave as if they were caoutchouc ; they fold up as high-hats " (13).

It is theoretically interesting that the occurrence of apparent movements in the mescal state depends to a certain extent on the nature of the stimuli. Certain observations show that small objects are more easily displaced than large ones ; objects which together with their surroundings form an optical " whole " and which are so to speak definitely anchored in optical respects are less likely to move than those which seem to be detached from their background ; objects the contours of which " suggest " movement are more likely to move than those with definite, well-marked contours ; objects the appearance of which gives the impression of weight are less likely to be displaced than those which appear light. It is to be noted that even under normal conditions our apparently stable world involves optically certain tendencies to

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movement. Whereas in everyday life we may be aware of only this *tendency* we find that in the mesal state this tendency, this implicit *dynamis*, is transformed into actually perceived movement. At this point we have to insist on the fact that it is not necessary at all that the subject be consciously aware of the above mentioned qualitative aspects of the phenomena. It is not necessary, for example, that he consciously judge a given object to be a "very small" object; what matters is not the judgment but the fact that "smallness" or the dynamic aspects above referred to phenomenally exist. If they exist, then, apparent movement is likely to occur. Expressed differently: we find empirically that apparent movement is likely to occur as soon as certain optical characteristics are present. We do not need introspective processes to see that the contours of an object "suggest" movement, involve a definite tendency to movement, as we do not need them for ascertaining the truth that an object is red. It is perhaps not necessary to point out that enumer-

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ating a number of optical aspects in the stimulus configuration does not *explain* the existence of apparent movement; we merely state the conditions under which apparent movement is observed. In short, it is the attempt at an analysis of the objective *Umfeld* undertaken with the view to describe as completely as possible the optical conditions under which apparent movement takes place. Our analysis is by no means complete and must be supplemented by an analysis of what *Gestalt* psychologists have called the *inner* *Umfeld*, the subjective factors. The will to see movement or to suppress apparent movement, the "attitude" of the subject and other factors are, as the records indicate, very important. But at present, our chief concern is to emphasize the importance of some optical aspects of the stimuli in the outer *Umfeld*. These aspects are of great theoretical interest since they are the same as those which have been brought out by the experimental studies on apparent movements in eidetic images. Some studies show that there may be also voluntary

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and involuntary "displacements" of *real* objects by eidetic individuals. The importance of the same factors is stressed in the literature on visual disturbances in patients with cerebral lesions or with pathological changes in tonus. These researches bring home to us that there are forms, configurations, and events in our optical world which possess a certain *dynamis* which under abnormal conditions or on certain developmental levels becomes apparent in movement.

In general, the behaviour of visionary objects and of real objects during the mesal state offers many striking parallels. Thus we have not only diplopia and polyopia of visionary, but also of real objects. The following observations refer to real objects: "Then a patient came to the window and laughed. When he left, there seemed to be two. Suddenly I noticed that the mirror image of these two ran away in the opposite direction . . ."; "somewhat later I fixated a point on the ceiling where I noticed some small flies and cobwebs. All of a sudden the number of the flies seemed to increase

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. . ." (13). Still more interesting is the following observation: "Being seated before Förster's adaptometer, M. passed me on my left side. I saw nothing but a part of his cloak. Automatically it turned into the whole figure of M.; and I had now some sort of idea that a large number of M.'s moved away from me in a curved line, the M. in the foreground being the smallest one. I was unable to say whether it was a very strong image or a vision; phenomenally, the many M.'s were projected into the perceived space of the dark room". This last example owes its importance to the fact that it suggests the possibility of imaginal polyopia. We might, then, distinguish imaginal, hallucinatory and "objective" polyopia in the mescal state. Here again mescal induces changes irrespective of the distinction between imagery, objective perception and hallucination. One is reminded here of the waste of scientific energy in attempting again and again to bring out the differences between "sensation" and "image" or—to use D. Hume's terms—between "impres-

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sion" and "idea". Instead of trying to establish two separate classes of mental experience, a more promising approach might be suggested: the attempt to determine those characteristics with regard to which various kinds of optical experiences such as memory-images, hallucinations, pseudo-hallucinations, eidetic and hypnagogic images, do not differ.

Some of the observations cited above refer to modifications of the objective stimulus which may be classed as "illusions". In some cases there is a very gradual transformation from a stimulus object into an illusory product; a dirty wall for example may induce the subject "to see things". "On the lime-washed, dirty, grayish-white wall there is a movement of lines, in different depth, against each other, horizontal and vertical . . . the lines could be interpreted, and through the interpretation the picture became more distinct. The middle of the wall was a spot interpreted as a house; small spots made the whole, without effort, into a long, castle-like building; I could see the windows

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and the ramp. Before them there was an elegant line which represented the shore of a pond in a very plastic way. The castle was reflected in the water. When my interpretative effort weakened, the whole picture persisted for a while, then other ever-changing pictures appeared, forming themselves slowly. At first the lines became always more distinct until something turned up without my being conscious of influencing the whole process . . . it was not possible any more to see nothing but lines, there was always something. . . . I did not succeed in seeing something intentionally without having the lines as a basis" (13). The same subject following in everyday life the procedure of Leonardo da Vinci or Johannes Müller was quite unable to "see" something on walls or ceiling, etc. At the same time, the experimenter found that comparing this subject with others mescal produced "the smallest number of optical phenomena". For another subject some threads lying on a picture turned into balls and filled up the whole picture as sea-nettles. Here

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the different phases of the transformation are not clear. The following excerpt from a record illustrates such phases especially well: "I had to look . . . at the wall . . . some stripes protruded, others receded, it was not any more a smooth wall though I knew it was a wall. Transparent cupolas appeared, made of fine misty stripes ; I could not determine whether they had a basis in the cigarette smoke^e of the room or in the stripes on the wall . . . sometimes the wall disappeared entirely, yet I had not the sensation of a hole or of meaningless cupolas in an otherwise normal room" (13). Though we may know the general nature of the visions and the behaviour of the visual images of a person, it is not possible to predict whether or not he will have illusions or the kind of illusions he will have looking at a given object. The records show that amorphous and very simple forms as well as objects highly differentiated in form and colour are the point of departure in the formation of illusions. It seems, however, that optically complex objects are more likely to form a basis

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for illusory products than optically simple forms.

One may expect that a drug which has in the majority of cases such a striking influence on the optical sensorium will alter the character of the dreams during the period of sleep following the intoxication. In normal life visual elements are predominant in the dreams of most persons; Sante de Sanctis speaks even of a *traduzione visiva* of all elements. One may expect that mescal will accentuate this visual character and that the subjects will report a large number of unusually vivid dreams. The analysis of the observations does not confirm such a view. Unfortunately, in some records no reference is made to dreams. In the following we quote the statements of different observers: "I slept quietly, deeply, and had no dreams"; "I could not sleep for about an hour, but after that I slept relatively well without having special dreams"; "in spite of falling asleep very late a deep dreamless sleep"; "I cannot recall my dreams during the night"; "I could see the

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star-like pattern in faint colours before my eyes until falling asleep.—No special dreams ” ; “ without sleep until 3 o'clock in the morning, after that unusually plastic colourful dreams ” (13). Personally, the only thing I could recall the morning after the experiment was that I had dreamed of discussing an abstract philosophical problem with a friend. Only one of the seven observers just quoted refers to unusually vivid dreams. The same observer awakening during these dreams was able “ to perceive very clearly the dream figures ” with open eyes, in the twilight of his room, for about ten seconds. After this period they faded away. The few observations available seem to indicate that an enhancement of visual elements in dreams is the exception rather than the rule.

In this analysis of the psychological effects of mescal we have been chiefly concerned with the visual effects. Emphasizing effects of visual nature we do not mean to imply that only the visual effects in the mescal state are of psychological interest. But it seems

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that at present the visual analysis is more promising than a consideration of the non-visual changes induced by mescal. Not only on account of the fact that mescal happens to be a drug which causes chiefly visual phenomena, but also because the visual sense belongs to the "objectifying" senses in the terminology of J. v. Kries. Many of the non-visual phenomena arising under the influence of mescal are of such a nature as to make it at present impossible to determine any constants in the flow of experiences. But in spite of the variability of the phenomena in the visual field it does seem possible to evolve for this modality certain criteria as has been already shown. There is no doubt that the general character of the visual experiences in the mescal state as brought out in our analysis cannot be viewed as an isolated datum ; this character must be considered in its relation to the changes induced in other sense fields, in the motor field and in the different reaction-systems of the personality.

Although it is not our aim to consider

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these concomitant changes in full detail we shall state briefly some of the effects noted in other sense fields. In our own case these effects were not very pronounced. "With regard to auditory stimuli, even noises caused by writing, swallowing, etc., seemed to be loud. Tones of my violin had a greater voluminousness than usual . . . With regard to organic sensations, I seemed to be 'beyond all desires'. I did not feel hungry or thirsty . . . frequently repeated gymnastic exercises seemed to be amusing rather than fatiguing. Walking was performed with remarkable ease". Dr. Eshner found the sense of taste benumbed and the sense of hearing less acute. One of Beringer's subjects reports "extraordinarily strong odors"; another one describes the smell of soap and powder as disgusting. In one of the subjects of Prentiss and Morgan the sense of smell was blunted to such an extent that he could not tell "whether or not tincture of asafetida was perfume". As regards taste, it happens for example that all food taken during the mescal state tastes

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“ like water ” or that saliva has the taste of good wine. But in general, changes in the olfactory and gustatory field seem to be rather infrequent. Changes in the auditory field are more frequently referred to. Tones and noises appear very loud and distinct or extremely faint and at a great distance. Over-tones are often noticed. Illusions and elementary hallucinations occur. Sometimes even voices are hallucinated.

The changes produced in the somatopsychic field and in related fields demand a more detailed consideration. We recall in this connection Serko's “ haptic hallucinations ”. Abnormal states of such a kind are also reported by other observers. It is difficult for the experimenter to form a precise idea of the nature of these phenomena on the basis of the descriptions given by the subjects. One person e.g. reports that he “ sees and feels ” his thorax constantly growing until it becomes a garden in which the arms are alleys. In another case the right half of the body was felt to be continuous with the surroundings. Still another subject

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found that with regard to his left hand there was no "feeling of continuity" with the rest of the body. A part of the abnormal experiences described by the subjects may be properly designated as abnormal temperature—, pain—, pressure—, touch— or kinesthetic sensations ; a part of them does not fit into psychological categories. An abnormal cold sensation is frequently localized in hands, feet or legs ; sometimes it seems to spread all over the body. Definitely localized warmth sensations are rather infrequent. Pain sensations are often associated with other sensations. Very often mention is made of unpleasantly toned pressure sensations caused by the clothing. A subject may get rid of his collar on account of a "feeling of strangulation" at his neck.

Objects touched with the hand may feel like "rubber" or "wax". "There was no metal which was hard and offered resistance ; the walls also appeared soft". Thus an irresistible tendency to manipulate or to "mould" objects arises. Some objects or even some of the limbs may

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appear abnormally heavy or without weight. The occurrence of such sensations may eventually throw light on the motor reactions in the mescal state. In this connection, we observe stuporous conditions as well as extreme restlessness. A person in the horizontal position intending to walk may need an assistant to bring him into the vertical position. In one of the cases of Prentiss and Morgan the drug caused such a marked "depression of the muscular system" that the subject was unable to walk or to speak above a whisper.

The following observations picture typical mescal effects: "I lost the feeling of bodily unity. The idea I could put an arm or a leg aside, separated from the body, seemed quite natural to me"; "my arm becomes suddenly long (not optically); leaning against the wall, I believe I shall sink; my coat . . . is to be buttoned only through my belly . . . my nose is of wax . . ." (13). In the last example, visual perception is normal. Sometimes some of the limbs seem to shorten or lengthen, a leg e.g.

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may seem several meters long ; sometimes the whole body "feels to be smaller". The bodily form may be distorted, the limbs may be "swollen" or they may "melt away". Irregular muscular contractions may take place in different parts of the body, yet the subject may doubt that the muscles belong to his body.

An experimental investigation of the sensory and perceptual changes just reported is extremely difficult. The experiments made so far do not yield any outstanding results.

A few remarks must suffice to characterize the various forms of synesthesia in the mescal state. We may quote some examples from the Heidelberg records : the hearing of rhythmically presented sounds is accompanied by the seeing of small gray circles ; disagreeable tones elicit skin sensations ; visually perceived movement is accompanied by tactile sensations ; bright light elicits a cold sensation. Or : "Whenever I touch something, I have light sensations". Or : "The barking of a dog moved the

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whole picture and vibrated through my right foot. This was so distinct that I thought it necessary to identify the dog with my right foot". Here we see that an existent visual impression is only modified. In cases of synesthesia the two sensory experiences often present themselves simultaneously.

IV

“ MESCAL PSYCHOSIS ”

“ Mais, ce qui est plus important, je crois . . . c'est de connaître l'action du poison sur la partie spirituelle de l'homme. . . . ” BAUDELAIRE.

Our discussion has been chiefly concerned with the formal characteristics of the sensory and perceptual phenomena in the mescal state. If we now recall the fact that some investigators speak even of a “ mescal psychosis ”, it becomes apparent that we have neglected important aspects of the psychological picture produced by the drug. Thus for Beringer the three main constituents of the mescal psychosis are: 1, abnormal sensory phenomena; 2, a fundamental change in conscious states and attitudes; 3, abnormal emotional states. He emphasizes the fact that these three “ fundamental reactions ” may appear independently of each other. For a better understanding of the visual phenomena

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we shall now discuss some phases in the psychotic state as caused by strong doses of mescal.

Undoubtedly in many instances the subject faces not only an abnormal external world, but also an entirely changed inner world during the mescal state. He has to accept the fact that objective events as well as ego-conditions are changed. But how is he to accept this fact? How is he to react intellectually and affectively to these changes produced by an alkaloid? But his "normal" modes of reaction are also changed; the question, therefore, reduces itself to a consideration of the various changes produced in "ego" and "world", in "subject" and "object", as well as in the subject-object relations. Thus we may observe a distortion of time and space, a modification in thinking and volition, disintegration on different levels of reaction, paranoiac reactions, delusions of reference and persecution, euphoria, and tendencies to "identification". Only a few of these psychotic trends will be discussed here.

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Very often the subjective experience of "time" undergoes definite changes. There may be e.g. "no time" or "eternity" or "a large, empty hole". A given period may appear infinitely long or short. The time for answering a simple question may appear to extend over hours. Upon "concentration" it is in most cases possible to make fairly accurate estimates as to duration. Nevertheless, the temporal appearance of real objects is frequently changed in a striking manner. The succession of visionary phenomena may also turn into an "in-describably overwhelming complexity" of a "stationary presence". Such paradoxical states are often associated with the above described disturbances in the perception of movement. Here it is of interest that in one of Beringer's subjects even the ability to imagine the movement, the successive appearance, of a given object was disturbed.

Time distortion and disturbances of associative processes may go hand in hand. Instead of temporal continuity there is a series of disconnected situations

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which the subject is unable to combine intellectually. A person going to the dark room registers for instance situations of the following kind : " Faces to the left—faces below me—strange corridor never seen before . . . people at the corner . . ." etc. " Every kind of thinking was extremely difficult for me. At first most situations appeared beyond understanding ; some of them I did not grasp at all " (13). The ability to organize and to abstract material is lost ; the determining tendencies suffer. To concentrate on something for a long while becomes impossible. It is to be noted, however, that some subjects speak of a " thought intoxication ", of a state which may prove to be actually quite productive. Such phases of productive thinking are usually of transitory nature.

A study of the Heidelberg records brings out the fact that euphoria is one of the typical mescal symptoms. In spite of marked nausea many subjects " have a good time " ; being in a state of mental exhilaration they become talkative and jocular, they commit social errors and

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enjoy committing them; harmless remarks, even a potato salad or a catsup bottle are considered unusually funny. Sometimes the euphoric state may have no foundation whatever in objective happenings. "Suddenly I noticed that I lost control over myself through my laughing and was forced to continue laughing without any stimulus object". Some subjects refer to "cosmic emotions" and to ecstatic states in which "our exclamations of enjoyment become involuntary". A few records indicate that mescal may cause fear and "horrible depressions"; one of the subjects of Prentiss and Morgan felt "that his life was leaving him". The drug apparently does not influence the sexual sphere in any specific way. The Indian peyote-eaters maintain that it inhibits sexual desires.

In using the term *presque vu*-experience we intended to designate special forms of visual experience. Such experiences may become of central importance in the mescal psychosis. The subject feels e.g. that he is near grasping a "cosmic" truth, but that, unfortunately, he does not quite

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succeed. A subject seeing a fretwork design may identify "himself" or "everything" with fretwork in the mescal state. Thus certain formal characteristics of the visual phenomena become so to speak the subject matter of the psychosis. The question arises: Is the form of the visual experiences not really the expression of more fundamental changes caused by mescal? If not, is it not at least considerably influenced by changes of such kind? Have the visual phenomena nothing to do with the personality-trends of the subject, with his attitudes, his interests and his complexes? Apparently they have not; at least in most cases there is no relation between the optical picture and the "inner life" of the person. The fact that one subject experiences a fretwork design as a phenomenon to be explained by certain findings in sensory physiology, and that another subject considers it not only of cosmic significance, but as the cosmos itself, is certainly an interesting contribution to the individual psychology of these subjects. But here we want to

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stress the point that both subjects see the fretwork-design, that means no matter what the reactions of the individual in the mescal state are, mescal produces certain typical visual effects uninfluenced by the personality of the subject. On the basis of our analysis we are able to predict these super-individual effects. But with regard to the psychotic symptoms, Beringer is probably right when he assumes that even on the basis of a very intimate knowledge of the subject it is absolutely impossible to predict the kind of mescal psychosis which he is going to develop. Beringer also asserts that after a careful study of various reports of mescal psychoses we cannot recognize any of them as belonging to this or that subject. So far, definite correlations cannot be established. At least so far as mescal is concerned we question Baudelaire's "Tout homme a le rêve qu'il mérite" and are sceptical concerning Rouhier's hope that this drug may become a tool in the hands of the psychoanalyst. There are interesting individual differences. We see on the one hand the individual with

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a critical *Einstellung* who naturally or intentionally detaches himself from the phenomena, on the other hand, the person who experiences or seeks to experience a unity of world and I. Again, there is a long way from the critical attitude to the mere registration of disconnected sensory contents, to the "passivity-syndrome". "I became so to speak a resigned observer who was trying in vain to catch expansive experiential qualities by means of an insufficient schematism, and I became more and more inclined to give up this kind of observation". There may be for a while a rapid shift from one idea to the other, from one sense experience to the other. But finally the subject cannot rid himself of the single experience, it becomes "everything", may it be a thread, a key, a scar, or a plate. All spontaneity being lost it is only this thread or this plate the individual is still conscious of. Or the idea "Dr. M. G." may be the only thing he is conscious of. Thus consciousness is narrowed down to the experience of sensory and imaginal details. But these details expand, they

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become everything : " I feel to be identical with the object ". This subject-object unity may be experienced in various ways : " It seemed to me as if tones, optical phantasms, body sensations, and a certain . . . taste formed a unity, as if what I experienced in my body and what I experienced perceptually in the external world were not separated any more, as if body and object were a unity " (13). Or : " The line of demarcation drawn between ' object ' and ' subject ' in normal state seemed to be changed. The body, the ego, became ' objective ' in a certain way, and the objects became ' subjective '. They became subjective not only in the sense that they behaved as visionary phenomena, but also in the sense that they gained certain affective qualities " (14).

In some individuals the " ivresse divine " Rouhier speaks of is undoubtedly not very pleasurable ; in fact, it is rather an " ivresse diabolique ". But in either case it is true that the experiences in the mescal state are not easily forgotten. One looks " beyond the horizon " of the normal world, and this " beyond " is

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often so impressive or even shocking that its after-effects linger for years in one's memory. No wonder that some of the subjects are disinclined to repeat the experiment and go through experiences which distort the "normal" world.

V

IMPORTANCE FOR RESEARCH

“ Il ne faut pas croire que tous ces phénomènes se produisent dans l'esprit pêle-mêle. . . . ”
BAUDELAIRE.

On account of its specific effects on the optical sensorium mescal is an excellent instrument of research for the psychologist. It is a very handy tool especially in the descriptive and genetic analysis of space and colour phenomena. Utilizing this drug we may study profitably various aspects of normal and abnormal visual perception, simultaneous and successive contrast, different types of colourblindness, entoptic phenomena, dreams, illusions, pseudo-hallucinations, hallucinations, synesthesia, *Sinnengedächtnis*, the relation of peripheral to central factors in vision, the rôle of visual elements in thinking and the psychogenesis of “ meaning ”. Owing to the subjectification of the “ objective ” world in the mescal state, an investigation of the last problem seems especially prom-

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ising. The study of eidetic imagery and of subjective visual phenomena in general may also consider with profit the nature and the behaviour of visual phenomena experimentally produced with drugs. Systematic experimentation undertaken with the view to obtaining a complete picture of the optical and non-optical effects in eidetic and non-eidetic individuals, in different constitutional types, in children, in primitives and in individuals of different social level cannot fail to yield definite results. The psychiatrist will be interested in the effects of mescal not only as a means for a more adequate appreciation of the visual disturbances in various diseases, but also as a possible avenue to a psychology of schizophrenia. The anthropologist studying the origin and the varieties of "visions" in different areas or the ornamental art of various tribes will be greatly interested in the existence of certain super-individual form-constants as found in mescal visions.

In general there is no doubt that the form of the visual experiences in the mescal

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state differs radically from the general form of the visual phenomena caused by other drugs ; but in some respects certain drugs lead to remarkably similar visual effects. Psychology, ophthalmology, psychiatry, and anthropology are in need of a detailed analysis of the optical effects of various drugs. In fact, a differential pharmacopsychology of form-constants is a desideratum. Unless we know these form-constants, we cannot consider those aspects of the visual phenomena which are due to the personality of the subject. Although at present there seems to be no uniformity in the way personality affects the character of the intoxication, it seems possible that some day the study of mescal effects will give us information about, what Miller has called, "the hinterland of character".¹

¹ Cf. E. Miller : *Types of Mind and Body*. Psyche Miniatures, 1926.

FINIS

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