

The Fourfold Discovery of “Mezcalin” (1896-1919)

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Abstract

This is an historical account of the pharmacological, chemical, and anthropological research concerning the molecular makeup of the peyote cactus (*Lophophora williamsii*) that laid the ground for Ernst Spaeth's structural elucidation of mescaline as 3,4,5-trimethoxyphenethylamine.

Keywords History of Science • Psychedelic Studies • Organic Chemistry
• Alkaloids • Mescaline • Drugs

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1 *Without Peyote, nothing would exist.*

2 José Bautista, Huichol shaman

3 **Introduction**

4 The exploration of the constituents of the peyote cactus and its effects upon
5 the human psyche was an interdisciplinary undertaking that defied national
6 borders. The material way to the heart of the matter, however, was mainly
7 paved in Europe - first in Berlin by the independent toxicologist Louis Lewin
8 (1850-1929), next at the Institute of Pharmacology at the University of
9 Leipzig by Arthur Heffter (1859-1925), and finally by Ernst Spaeth (1886-
10 1946) at the Institute for Chemistry in Vienna. Especially after the isolation
11 of mescaline by Heffter, and even more so after Spaeth's synthesis,
12 mescaline itself began to be considered as a purely pathological substance
13 with no medicinal, not to speak of spiritual or hedonistic potential
14 whatsoever. How did this excessively restricted view on a substance that
15 later was defined as "central standard against which all other [psychedelic]
16 compounds are viewed" [1] come about? To find an answer to this question,
17 one has to go back to the end of the 19th century and reconstruct how
18 mescaline came into being in the first place.

19

20 **How it all began**

1 Let us start with the usual beginning of an often-told story: At the age of 38,
2 Louis Lewin, by then a scholar with an international reputation, went on a
3 trip across North America [2].¹ His last stop was at the pharmaceutical
4 corporation Parke, Davis & Co, where he was asked for his learned opinion
5 on some dried specimens of an allegedly unknown plant.² He was only told
6 that this plant was from Mexico, “used as a narcotic, food, or relish” and
7 traded as “Muscale Buttons” [5]. Back in Berlin, the plant was classified as
8 belonging to the family of cactaceae and registered as a new species by Paul
9 Christoph Hennings (1841-1902), then custodian at the Botanical Gardens
10 [6].³ As the first demonstration of the toxicity of a cactus, the text “Ueber
11 Anhalonium Lewinii” [8] will become the common cornerstone of the
12 scientific investigations to come. Lewin managed to extract a syrupy,
13 resinous substance and called it “Anhalonin”. He went on to administer “this
14 substance, which”, according to Bruhn/Holmstedt, “was in fact a crude
15 mixture of alkaloids” to some animals (frogs, rabbits) to ascertain the lethal
16 dose [9]. The graphic descriptions of the dying animals were documented
17 with morbid fascination, since it was “the first time”, as Lewin solemnly

¹ For more information on Lewin’s historical role with regard to toxicology, see [3].

² Probably by Parke-Davis’ superintendent H. A. Wetzel; for more on this ‘back story’, including the role of the Texas-based physician John Raleigh Briggs (1851-1907), whose horror trip caught the attention of George S. Davis, general manager of the respective company, see [4].

³ Meanwhile, in the United States, Parke-Davis contacted Sereno Watson from the Botanic Garden at Harvard University in Cambridge, Massachusetts. He also recognized the cactus as belonging to the genus *Anhalonium*, and also thought it might be a new species [7].

1 concludes his paper, “that any such violent symptoms have ever been
2 accredited to a Cactææ” [5].⁴ Lewin’s findings were published in the
3 renowned Naunyn-Schmiedeberg Archive and a slightly edited translation
4 of the same paper appeared in the *Therapeutic Gazette* in the same year. In
5 the American publication, Lewin ends with the wish to soon be able to
6 publish a more detailed account of ‘his’ plant and surmises that “it is far from
7 improbable that this substance [i.e. anhalonine] may also be of therapeutic
8 value” [5]. Indeed, already in the following year, a resourceful medical
9 doctor - S. F. Landry, from Logansport, Indiana - ascertained that
10 “Anhalonium Lewinii” was a valuable adjuvant to digitalis, especially
11 helpful for the treatment of pneumatic disorders. Along with this assertion,
12 he disseminated the recipe for a homeopathic tincture that additionally
13 contained belladonna, cannabis indica, and water [11].

14

15 **Naming and Referencing**

16 Five years later, at the onset of his first publication, Heffter deemed it
17 necessary to make some etymological clarifications. According to Mr.
18 Tischer, M. D., who lived “for a couple of years” in the state of Durango and

⁴ Actually, it was Frank Augustus Thompson, a chemist at Parke-Davis, who was first to discover the alkaloidal content of this plant. But, since he documented his findings only in a laboratory report (dated 5 July 1887, cf. [10]), they were neither available to the public, nor to the scientific community. Hence this does, according to the intersubjective nature of science, not count.

1 had an exchange of letters with the head of the Leipzig Institute of
2 Pharmacology, Prof. Rudolf Boehme, “muscale” was no Spanish word at all
3 but might be a corruption of “Mezcal (brandy made of agaves)” [12].⁵ The
4 common name of the cactus at stake was, with all due certainty, “Pellote” -
5 to be pronounced, as Heffter adds in brackets, “Peyote” [12]. In addition, he
6 surmises, “the Mexicans” call two of the four cacti he is about to examine
7 indecisively by this very name.⁶ In one of them, *Anhalonium fissuratum*
8 - today tellingly known as “*Lophophora diffusa*”, peyote’s false friend -, he
9 found an active alkaloid, managed to figure out its chemical formula
10 ($C_{13}H_{21}NO_3$),⁷ and named it pellotine.⁸ For peyote itself, Heffter was able to
11 find not only one, but three alkaloids at this stage. To underscore the
12 preliminary status of his discovery, he named the alkaloids provisionally “A”
13 and “B”; the existence of the third one was only hypothetically posited. This

⁵ This and the quotations from Heffter to follow, personal translations.

⁶ This is, of course, a rather doubtful suggestion. To use indigenous knowledge for bioprospecting plants, while at the same time questioning its reliability is an epistemic strategy with a long tradition. A ‘pinnacle’ in this regard is William E. Safford’s (1859-1926) estimation that the vainly sought for *teonanacatl* or “magic mushroom”, as documented in a number of ancient Aztec texts and anthropological accounts, was actually no mushroom at all, but that very peyote cactus! He explains this theory with the morphological similarity of the button-like form of dried slices of peyote with that of mushroom caps, together with the insinuation that “it is very probable that they [the Atztecs] had not the slightest notion of the difference between a flowering plant and a fungus” [13]. As strange as this hypothesis might seem today, it was quite influential and only began to be questioned - notably, and independently, by the two exiled Austrians Blas Pablo Reko (1877-1953) and Robert J. Weltaner (1883-1968) - a decade later [14].

⁷ This was later corrected by Heffter himself to $C_{13}H_{19}NO_3$ [15].

⁸ Pellotine has markedly sedating effects, which is the reason why it immediately caught the attention of psychiatry and was already tested in 1896 in Vienna [16] and in Berlin [17]. The results were promising, but the first synthetically produced sedatives, especially the blockbuster-drug Veronal, pushed the less cost-effective cactus-alkaloid aside.

1 uncertainty was due to the scarcity of raw material.⁹ Nonetheless, he
2 succeeded in producing crystal-like structures of two different kinds -
3 “beautiful very shiny colorless needles” (A) and “little rhombic plates
4 without gloss” (B) [12]. Instead of a thorough analysis, which was not
5 possible because of material shortages either, some simple color reaction
6 tests were successfully accomplished. When administering A to a “cheerful
7 *Rana temporaria*” [12], the common or European grass frog showed none of
8 the enhancement of reflex activity Lewin had observed, but it seemed to have
9 some lowering effect on the central nervous system. Similar results were
10 obtained with B. Unlike with pellotine, Heffter - for now - did not test these
11 alkaloids on himself.

12 In response to this, Lewin presented his intermediate findings within
13 the same year [18]. He started with a quotation from the Franciscan friar
14 Bernardino de Sahagún (1499-1590), the “father of modern anthropology”
15 [19], documenting the earliest evidence of the native use of this cactus, as
16 well as further observations by the physician Francisco Hernandez (1515-
17 1587) and others. These text passages, together with the ethnographical
18 findings that Arthur Heffter collected, would gain a somewhat canonical
19 status, as they came to be repeated again and again as preliminary notes in

⁹ As Heffter noted meticulously, he did not have more than “four fresh plants, with a total weight of 399 g” at hand [12].

1 research on peyote and mescaline. Whereas Lewin's sources were historical,
2 supplied by Eduard Seler (1849-1922), the then leading authority on Aztec,
3 respectively Nahuatl culture, Heffter was mostly informed by contemporary
4 anthropological findings. He was, for example, well aware of the recent field
5 studies of James Mooney (1861-1921) and Carl Sophus Lumholtz (1851-
6 1922), who were among the first to witness traditional peyote ceremonies,
7 and Heffter gave an account of their reports in his pharmacological
8 publications.¹⁰

9

10 **On the wrong track**

11 Meanwhile, Lewin, in cooperation with the Merck chemist Kauder, (see also
12 [20])¹¹ was able to show the crystalline structure of anhalonine, and he did
13 further experiments with a number of frogs and rabbits, to which he
14 administered anhalonine in different solutions and doses. He concludes these
15 experiments by underscoring its cramp-generating propensities and states
16 that, "insofar as animal experiments can provide information regarding these
17 compounds, they don't seem to have the narcotic effects sought after by the
18 Indians [!]" [18]. He added, however, that the other parts of the plant would

¹⁰ With Lumholtz, Heffter even exchanged letters and acquired material for his research (peyote from the Huicholes, used for his series of self-experiments in 1898, cf. [15]).

¹¹ Merck was, at least since 1895, when the first official report regarding "Anhaloninum" was published, well aware of the developments in this nascent cactus field. The first entry on *Mescalinum sulfuricum* appears in 1913 [21, 22].

1 undoubtedly bring about the symptoms so many have been reported already
2 [18]. “It is not impossible”, Lewin surmises, “that this strange plant contains
3 yet another effective principle that, similar to morphine in opium, gives the
4 main-direction, which might be able to overpower the other existing
5 alkaloids, and hence also that of anhalonine.” And he anticipatively
6 concludes: “Maybe this principle is to be found in one of the alkaloids
7 Heffter found in Anhalonium Lewinii” [18] (personal translation).

8 In 1895, Prentiss and Morgan conducted the first serial study of the
9 effects of peyote on humans. As an introduction, they presented the findings
10 of Ervin E. Ewell from the Bureau of Chemistry of the United States
11 Department of Agriculture. Ewell worked on the (erroneous, as will soon
12 become clear) hypothesis that the “activity of the drug is due mainly to the
13 resinous bodies and not so much to the alkaloidal constituents” [23].
14 Nonetheless, since the test subjects were mostly administered not with these
15 bodies, but with slices of the cactus plant itself, “delightful visions”, “loss of
16 conception of time and space”, and a range of other typical symptoms could
17 be observed [23]. Ewell apparently also dosed himself with the cactus, as is
18 reported by Frederick M. Smith in his search for *The Higher Powers of Man*
19 (= dissertation title): “Doctor Ewell, (though an agnostic) while under its
20 influence argued verbosely that there was a heaven, because he saw it” [24,
21 25]. Considering the potential medicinal usage of this plant, Prentiss and

1 Morgan, relying mostly on second-hand sources, came to the conclusion that
2 they were dealing with a very promising drug indeed, with a wide range of
3 possible applications, as an antispasmodic, a cerebral stimulant, and, not
4 least, for treating color blindness (cf. [26] for the full list of indications).
5 Notably, they published their findings under the name “Anhalonium
6 Lewinii”, the legitimacy of which had, by then, already been challenged by
7 German botanists (cf. [27-29]).

8

9 **Mezcalin in itself and for us**

10 After being equipped with 1.37 kg of dried peyote buttons, provided by
11 Parke-Davis, Heffter made the decisive breakthrough, on the material plane,
12 in the year 1896. He isolated and identified four different alkaloids. The first,
13 most probably the alkaloid formerly known as A, he called - without much
14 ado - “Mezcalin,” and presented its chemical formula as $C_{11}H_{17}NO_3$. The
15 other alkaloids were anhalonidine ($C_{12}H_{13}NO_3$), anhalonine ($C_{12}H_{15}NO_3$),
16 and lophophorine ($C_{13}H_{17}NO_3$).¹² Since this paper appeared in *Berichte der*
17 *deutschen chemischen Gesellschaft* [31], the pharmacological properties of
18 these alkaloids were not discussed. It seems that Heffter did not know, at this
19 point, that this “Mezcalin” was the long sought for ‘philosopher’s stone’.

¹² These formulas are still valid; for more details, and a complete account of additional, pharmacologically active as well as non-active alkaloids of peyote, cf. [30].

1 Although this cannot be stated with certainty, two indications make it at least
2 plausible: (1) Heffter only tested the effects of these alkaloids one year later
3 and (2) it is quite improbable that Heffter would have named the main
4 psychoactive ingredient of peyote with an expression that he himself already
5 knew to be a misleading corruption.¹³ The fact that this actually *is* the sought
6 for quintessence of the peyote cactus would only be proven in the course of
7 a whole series of self-experiments,¹⁴ as documented in Heffter's 1898 paper
8 - which is, according to Perrine, "deservedly regarded as a classic in
9 psychopharmacology" [25].

10 At the outset, Heffter once again gives an extensive account of the
11 anthropological and etymological material he and Lewin were able to find,
12 and he summarizes the experiments that were conducted in the United States.
13 Then, he takes a stand in the ongoing debate with botanists (arguing that a
14 difference in the alkaloidal constitution of a plant should indeed be regarded

¹³ The resulting confusion reverberates until today, with people thinking of schnapps when hearing mescaline. Similar to "Indian", the misnomer "mescaline" may be read as a verbal monument for the white man's ignorance in anthropological affairs.

¹⁴ A step that Lewin, for whatever reason, was not willing to take. Instead, he sent samples to psychiatrists, among them Alfred Guttmann (1873-1951) in Berlin, who was the first German psychiatrist to experiment on himself with anhalonine. Guttmann also had chopped up pieces of cactus at hand, and states that he took these, and anhalonine, with breaks over a period of one to four weeks. But he does not specify which one of these led to the exhilarating experiences he goes on to describe in much detail. It can, however, be inferred, that it was the cactus itself that brought about all sorts of "hallucinations" [32]. While Guttmann administered the cactus (and anhalonine) only on himself and his colleague Dr. K., it was another psychiatrist, namely Johannes Bresler (1866-1942), who gave it to patients already in 1905. Most of his unsuspecting subjects realized that they were under the influence and they had visions with a religious pull. Bresler suggested that peyote might be used as a means to "push back on usually occurring and persistently distressing hallucinations with more pleasant mescal-hallucinations" [33] (personal translation).

1 as sufficient grounds for asserting a separate species),¹⁵ before giving a
2 succinct recapitulation of his findings from 1896, and finally meticulously
3 describing his self-experiments, which lead him to the conclusion that
4 “Mezcalin” undeniably is to be regarded as *the* effective principle of the
5 peyote cactus. In order to single out the specific alkaloid, Heffter thought it
6 necessary to get a first-hand experience of the effects of the cactus as a
7 whole. Reports by Prentiss and Morgan, and by the “first psychonauts” S.
8 Weir Mitchell (1828-1914) and Henry Havelock Ellis (1859-1939),¹⁶ which
9 he all had at hand, functioned as sort of a guideline. He experienced quite an
10 intense trip, complete with “wonderful color apparitions”, “visions of the
11 beaches of Nervi (Italy)”, and a loss of the sense of time.¹⁷ Next, he tried the
12 resinous substance, which basically is everything but the alkaloids, with no
13 effects but a slight headache and weariness that ebbed away after about an
14 hour. On the other hand, the sulfate containing all the isolated alkaloids
15 together - in a dose equivalent to 16.67 g of the cactus - did produce the
16 sought for effects. Now, Heffter had to single out which one of the alkaloids

¹⁵ Much has been said about the so-called “Anhalonium controversy” and the difficult relationship between Heffter and Lewin (cf. [9, 25]. Regarding the question of the identity of the cactus, and its proper place in the taxonomic order, these supposed animosities were, however, put aside and there was a disciplinary closing of ranks, in which Heffter and Lewin stood united against the ‘scholastic’ botanists.

¹⁶ Cf. [34, 35] and Perrine [25], who attributes Briggs, Lumholtz, and Mooney as “first psychonauts”; the term, originally coined by the German author Ernst Juenger (1895-1998), seems, however, better to fit to Ellis and Mitchell, since they made use of the cactus in their own way, as contrasted to the anthropologists, and did attain a state of mind that was more than sheer panic, as in the case of Briggs.

¹⁷ Remarkably, Heffter does not note anything about the emotive side of the experience but feeling nauseous.

1 played the leading role. He started with a dose of 0.15 g mescaline
2 hydrochloride. After two hours, “violet and green stains show[ed] on the
3 paper while reading” and sometime later, he had “visions” of “landscapes,
4 halls and architecture”. For the sake of completeness, he then went on to test
5 anhalonidine and Lewin’s anhalonine on himself, without any effect.
6 Lophophorine had only mild sedative effects. Thus, there was no doubt that
7 it was “the mescaline which exclusively caused the characteristic symptoms
8 of a mescal[!]-intoxication, and, above all, that it solely induced the yet
9 unprecedented visions” [15].

10 Taking all of this into account, it may be argued that mescaline was
11 discovered three times by Heffter: first, *materially*, as a loosely identified
12 alkaloid, then, *molecularly*, as a chemical formula, and finally,
13 *experientially*, as the actually looked for, “vision-inducing” main active
14 ingredient of the peyote cactus. By then, the hallucinatory effects had already
15 been firmly established as the unique feature of this plant/substance,
16 although this might be somewhat misleading. Says eminent ethnobotanist
17 Richard Evans Schultes: “In my opinion, the principal appeal of peyote has
18 been and continues to be centered around the therapeutic and stimulating
19 properties of the plant and not around its vision producing properties. In
20 other words, the peyote vision has been incidental while the medicinal
21 reputation of peyote has been fundamental in the establishment, spread, and,

1 to some extent, in the maintenance of the peyote cult in the United States.”
2 [36] Nonetheless, it was certainly the visual component that fueled the
3 interest of Western scientists. And, since its threefold discovery, mescaline
4 will always already have been there,¹⁸ be it therapeutic or visionary.

5 Based on his first-hand experience, Heffter predicted that “thankful
6 opportunities” would lie ahead for physiologists and experimental
7 psychologists [15]. The question of whether the cactus as a whole might
8 prove to have therapeutic value he explicitly left unanswered. For mescaline
9 as such, however, he negated this possibility. Furthermore, he doubted, in
10 view of the side effects he had to endure, that this drug would ever become
11 popular “among civilized nations” [15].¹⁹ It might well be that this estimation
12 is one of the reasons why it took so long for scientific experimentation to
13 start with mescaline. The medical sciences did obviously not yet know what
14 to do with this overwhelmingly powerful alkaloid. Contrary to the instant
15 application of Heffters pelletine,²⁰ mescaline only began to be tested on
16 humans more than a decade later.

17

¹⁸ To paraphrase Bruno Latour (*1947) celebrating the very first synthesized compound, lactic acid: "Once discovered by Pasteur in 1857, lactic acid yeast has always already been there, from Neolithic times in the gourds of homo sapiens to the present in the whey that is souring in all the dairies on earth." [37].

¹⁹ This is to be read in direct opposition to Mitchell and Ellis. Says the latter: “I fully agree with Dr. Weir Mitchell, that there is every likelihood, that mescal (read “peyote”) will become popular.” [35]. Not yet aware of the existence of mescaline, it is also the cactus as such that Ellis believes to be “the most democratic of the plants which lead men to an artificial paradise” [38].

²⁰ Cf. footnote 8 above.

1 **Under quarantine**

2 The very first human trials with “Mezcalin” were carried out by the two
3 Kraepelians Alwyn Knauer und J. M. A. Maloney.²¹ Since this was still a
4 few years before Spaeth’s synthesis, they administered their subjects with
5 ‘natural’ mescaline as isolated from the cactus plant. Nonetheless, these
6 experiments set standards for the following boom of research during the
7 interwar period, as mescaline was considered to be a suitable means (1) to
8 figure out thresholds between normal and pathological sense perception, (2)
9 to investigate the “mechanism of visual hallucinations”, and (3) to induce
10 “transitory psychosis” [40]. Generally, mescaline came to be understood as
11 a purely (psycho)pathological substance without any medicinal virtues.
12 Concomitantly, its usage was restricted to psychologically trained
13 professionals and its supposedly maddening effects were contained inside
14 the walls of psychiatric institutions.²² During the following decades of
15 intensified mescaline research - materially enabled by Spaeth’s structural
16 elucidations - these initial judgements were consolidated.²³

17

²¹ Year of birth and death in both cases unknown. Knauer presented his initial findings at the “Versammlung der deutschen Irrenärzte” (meeting of the Bavarian alienists), held at Pentecost 1911 in Munich [39]. The only other available source for these trials is “A preliminary note on the psychic action of mescaline, with special reference to the mechanism of visual hallucinations” (1913), co-written by Maloney [40].

²² “The hospital environment with its white walls, institutional sounds and smells, and constant associations with illness and medical authority has on occasion contributed a psychotic note to the drug experiment”, says Shulgin in view of the history of mescaline [41].

²³ For an overview of the human trials with mescaline, see [42, 43].

1 In other words, the grounds for psychiatry's interpretational sovereignty over
2 this psychedelic prototype were technically paved with the emergence of the
3 possibility to artificially produce mescaline. Ideologically, Spaeth's *al-*
4 *chemical* operation seems to have allowed for the semantic dissociation from
5 the age-old 'symbolic contamination' with which its mother plant was
6 traditionally associated.²⁴ At the same time, and in the other direction,
7 psychiatrics' secularizing agenda gained 'anthropological' relevance, as the
8 symptoms evoked by mescaline were synecdochally equated with those of
9 the cactus, with the effect that the latter retroactively also became
10 conceptualized as "hallucinogen".²⁵ This deceitful egalitarianism was only
11 possible due to the negligence of the material genealogy of mescaline, which,
12 as illustrated above, succeeded precisely on the basis of a differential
13 analysis of the different alkaloids of peyote. That the alkaloids "in the whole
14 plant", as Weston La Barre, author of *The Peyote Cult* (1938) pointed out,
15 "are not synergistic but antagonistic" [47], was generally ignored in the
16 interwar period. And what was said of mescaline was, by some strange

²⁴ The oldest existing peyote buttons, whose alkaloidal content was proven by thin-layer chromatography and gas chromatography-mass spectrometry, have, by radiocarbon dating, been shown to have a mean age of 5700 years [44]. At the beginning of the 20th century, while peyote was being broken down into its parts in Europe, in the US, where cacti are, of course, endemic, the Native American Church was established. It is a noteworthy coincidence that the first initiatives for the foundation of this religion can be traced back to the year 1896, the same year mescaline was isolated, and that it was consolidated in the same year Spaeth actually accomplished his synthesis (which was only published a year later). (cf. [45]).

²⁵ Still today, the official umbrella term to be used in "normal science" [46] is „hallucinogens“. Insofar as this expression evokes associations with madness it is not only implicitly pathologizing and depreciatory, but also metaphysically naive, since the absence of something that somehow obviously *is* there, is simply taken for granted.

1 hermeneutic twist, also taken to be true for the cactus as a whole, or its
2 unadulterated parts.

3 By willingly disciplining his way of perceiving the matter (he sums
4 up the anthropological dimension of the cactus in only two lines at the
5 beginning of his seminal paper), Spaeth succeeded in *synthesizing* the very
6 same substance ($C_{11}H_{17}NO_3$) with different raw material. The liberation from
7 the necessity to obtain rare natural resources allowed for the production of
8 any desired quantity of mescaline. Although some resourceful chemists at
9 the pharmaceutical company Merck - the main supplier of mescaline until
10 after WWII -, by 1926 will have found a more efficient way to meet growing
11 demands [48], it was still on the basis of Spaeth's protocol as laid out in 1919
12 that mescaline was produced. The details of his findings are beyond the
13 scope of this paper.²⁶ For the present investigation, it shall suffice to say that
14 gallic acid played an important role in substituting the natural constituents,
15 and to emphasize that the toxicological, chemical, pharmaceutical, and
16 anthropological findings by Lewin, Heffter,²⁷ etc. were the discursive
17 background against which the gestalt of mescaline could take shape.
18 Nonetheless, the first fully artificial synthesis was definitely Spaeth's own
19 accomplishment - and therefore his elucidation can be regarded as the fourth,

²⁶ For more cf. [49].

²⁷ Spaeth even corresponded with the latter, although not concerning mescaline, but anhalonine, which he dealt with in the same paper [50].

1 for lack of a better word, *essential* discovery of mescaline - or 3,4,5-
2 trimethoxyphenethylamine as we know it today.²⁸

3

4 **One of a class**

5 The uncovering of the quintessence of peyote finds correspondences in the
6 isolation of morphine from opium, as Lewin indicated, or of cocaine from
7 coca leaves. While it seems clear that, in these instances, the original plant
8 has a rather different effect upon the human mind compared to its
9 derivatives, just as morphine *as well as* opium are *sedatives*, and cocaine *as*
10 *well as* coca leaves are *stimulants*, mescaline *and* the peyote cactus can -
11 pharmacologically - be understood as one of a class. It is necessary, for the
12 sake of the argument, to emphasize this with regard to the aforementioned
13 somewhat contradictory estimation: not only the suggestion that mescaline
14 is indeed the *main* psychoactive substance of peyote hinges upon this
15 hypothesis of a categorical commonality, but also, by extension, the
16 supposition that mescaline (or peyote) is *proto-typical* for ‘psychedelic’
17 substances (or plants) in general.²⁹ While the adequate label for this arguably
18 quite particular class of drugs changed historically, and is still debated,³⁰ the

²⁸ Spaeth’s original notation was α -[3,4,5-trimethoxyphenyl]- β -aminoäthan] [50].

²⁹ For peyote being “the prototype of New World hallucinogens”, cf. [9] and for defining mescaline as “central standard”, cf. [51] as quoted at the beginning of this paper.

³⁰ Lewin, who was probably the first researcher to single out this class of drugs, named it “Phantastica” [52]. Before they were officially labelled as “hallucinogens”, mescaline and LSD had been tested as “psychotics” or “psychotomimetics”. The British psychiatrist Humphry Osmond (1917-2004) coined the

1 substances which it refers to did basically not change but in number, with
2 so-called ‘research chemicals’ constantly enlarging the list.

3 Albeit the simpler, some might even say more beautiful structure of
4 the phenethylamine mescaline is, *molecularly*, quite different from the
5 tryptamine lysergic acid diethylamide, or LSD - by now the most famous
6 representative of its class -, they can, *experientially*, be regarded as members
7 of the same group of drugs. In terms of the interdependence of structure and
8 pharmacological action, the last, and, for that matter, first resort to decide is
9 a personal investigation of their respective effects.³¹ Just like a
10 Wittgensteinean “language game” is initially informed by an exemplary
11 instance, which is then transferred to other examples, not by an application
12 of definite rules, but by way of discerning “family resemblances” [56], an
13 assertion of group affiliation that is to some degree independent of material
14 configurations has to rely on subjective first hand impressions, or reliable
15 reports thereof, and can only be derived by way of prime examples, in this
16 case mescaline.

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18

term “psychedelics” in correspondence with Aldous Huxley (1896-1963), whom he inspired to write *The Doors of Perception* (1954) and other ‘pharmacognostic’ treatises by administering mescaline. Later, ethnobotanist Jonathan Ott (*1949) et al., came up with another neologism, namely “entheogens”, which may best be translated as “becoming divine within” [53].

³¹ Among the first who did a psychoanalytically informed differential diagnosis of LSD and mescaline was Walter Frederking, the psychologist who also dosed Ernst Juenger with mescaline [54, 55].

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