(Unfinished) Review of PIHKAL: A Chemical Love Story

by Alexander Shulgin and Ann Shulgin

This document is a response to a careful reading of this fascinating book by the Shulgins. It is a long document, and contains five main sections:

1) Theology of Sulfur (a scientific response)
2) A New Vocabulary (a review of PIHKAL)
3) So Many Phenethylamines, So Little Time... (a guide to PIHKAL)
4) References
5) A Table of 311 Phenethylamines

This review is considered to be unfinished, because there is so much in PIHKAL that it would not be possible to ever finish exploring, and because this author has other universes to explore as well. So many universes, so little time...

Theology of Sulfur
A Scientific Response

Some of the richest of the compounds discovered by the Shulgins are those containing sulfur. For those of you who want to follow the sulfur route right over the edge:

> "Oneirine theophosphate is one way around the problem. (Tchitcherine: 'You mean thiophosphate, don't you?' Thinks indicating the presence of sulfur.... Wimpe: 'I mean theophosphate, Vaslav,' indicating the Presence of God.).... There is in Laszlo Jamf's celebrated molecule a particular twist, the so-called 'Pokler singularity,' occurring in a certain crippled indole ring, which later Oneirinists, academician and working professional alike, are generally agreed is responsible for the hallucinations which are unique to this drug. Not only audiovisual, they touch all senses, equally. And they recur. Certain themes, 'mantic archetypes' (as Jollifox of the Cambridge School has named them), will find certain individuals again and again, with a consistency which has been well demonstrated in the laboratory (see Wobb and Whoaton, 'Mantic Archetype Distribution Among Middle-Class University Students,' J. Oneir. Psy. Pharm., XXIII, pg. 406-453). Because analogies with the ghost-life exist, this recurrence phenomenon is known, in the jargon, as 'haunting.' Whereas other sorts of hallucinations tend to flow by, related in deep ways that aren't accessible to the casual dopefiend, these Oneirine hauntings show a definite narrative continuity, as clearly as, say, the average Reader's Digest article. Often they are so ordinary, so conventional - Jeaach calls them 'the dullest hallucinations known to psychopharmacology' - that they are only recognized as hauntings through some radical though plausible violation of possibility: the presence of the dead, journeys by the same route and means where one person will set out later but arrive earlier, a printed diagram which no amount of light will make readable. ...On recognizing that he is being haunted, the subject enters immediately into 'phase two,' which, though varying in intensity from subject to subject, is always disagreeable: often sedation (0.6 mg atropine subcut.) will be necessary, even though Oneirine is classified as a CNS depressant.
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> "About the paranoia often noted under the drug, there is nothing remarkable. Like other sorts of paranoia, it is nothing less than the onset, the leading edge, of the discovery that everything is connected, everything in the Creation, a secondary illumination - not yet blindingly One, but at least connected, and perhaps a route In for those like Tchitcherine who are held at the edge...." Pynchon (1973) Pp. 702-703

Abstract

The recent publication (Shulgin & Shulgin, 1991) of a large body of data on human pharmacology of phenethylamines provides an opportunity for review and interpretation. This review focuses on the following two points: 1) Many phenethylamines affect uniquely human aspects of mental function. 2) Human subjects can distinguish dozens or perhaps hundreds of phenethylamines. The interpretation of these data is that evolution of new human functions of the brain may have been accompanied by the evolution of a diversity of chemical communication systems. Many phenethylamines interact selectively with these diverse chemical systems, providing a set of tools for selective study of these functions in the intact human mind.

Over the years a growing list of centrally active phenethylamines has become known, and many of these exert effects in human subjects that involve uniquely human mental properties, such as the religious or aesthetic sensibilities. In spite of the fact that these chemicals interact with uniquely human aspects of the mind, much of the work on their pharmacology has been conducted with animals.

None-the-less, there have been active programs of human studies underway, and a recent publication (Shulgin & Shulgin, 1991), presented data from thirty years of research involving hundreds of compounds tested in humans. The subject of this 978 page book is the chemistry of the human mind, and the methodology of its exploration. The life work of Alexander Shulgin, summarized in this publication, has led to the development of a methodology for the exploration of the chemistry of the human psyche, and he has used that methodology to generate a large set of chemical tools.

These tools are non-invasive probes of the intact human mind. Each individual chemical in this tool set increases the activity of specific pathways of the brain above their normal background activity level. This generates a strong subjective experience of whatever function those specific brain tissues have in the normal intact mind. The altered activity is transient, generally lasting several hours, after which the normal balance of activity returns.

The book describes 311 chemical compounds, of which 120 were explored to fully active levels. Each of these materials has a unique spectrum of activity, in the sense of which brain tissues it activates. Phenethylamines are only one of many classes of chemicals which alter the activity levels of specific brain tissue. What sets phenethylamine compounds apart, is that some of the brain pathways whose activity they alter, affect uniquely human functions, such as cognition, the religious or aesthetic sentiments, the self-concept, fantasy, childhood memories, and the unconscious human psyche.

This last observation underscores the significance of Shulgin's contribution. The collection of chemical tools he has developed make possible the dissection of features of the human mind that can not be explored in animal studies. The physical structures of the brain, activated by phenethylamines, which support the unique features of the human psyche, may have no counterpart in non-human animals.

It is for these reasons that the methodology developed by Shulgin is so important. The methodology was first presented in Shulgin, Shulgin and Jacob (1986) and is revealed again

in greater detail in the first half of Shulgin & Shulgin (1991). The method involves careful titration of one human (Shulgin himself) with each new compound, with special attention to signs of toxic effects. This is followed by testing at active levels by Shulgin and his wife Ann, and then by a research group consisting of close friends. Each subject writes a report of the experience after each experiment.

Shulgin's work is what might be called the natural history of the chemistry of the mind. The work is largely descriptive: the determination of which compounds are active, at what levels, and the characterization of their subjective qualitative effects (he has also done considerable work in developing techniques for the synthesis of these compounds).

For most readers of Shulgin & Shulgin (1991) this natural history will be all that matters. The tools can be used by individuals to explore components of the psyche whose discreteness is normally obscured by their being embedded in the complete tapestry of the mind. By activiting specific components of the mind, they are made to stand out against the background of the remainder of the psyche, and their specific contribution to the psychic whole can be better appreciated. This is a valuable process of self-realization (Shulgin & Shulgin, 1991, p. 24):

> ...mescaline no more produced beauty than TMA produced anger. Just as the beauty was always within me, so was the anger. Different drugs may sometimes open different doors in a person, but all of those doors lead out of the same unconscious.

However, from the perspective of the neurobiologist, the natural history of the mind should be only the first phase of the research program. The next phase concerns the location and mechanism of action of these compounds in the human brain. A great deal is already known of the mechanisms of action of a few phenethylamines in animals. The mechanisms in humans are no doubt essentially the same, and probably vary only in detail. The basic mechanism of action involves inhibition or excitation of some pathways of the brain as a result of binding and blocking or activating the receptors of neuro-transmitters such as serotonin or dopamine.

What is most intriguing about the phenethylamines is how subtly different molecules cause subtly different subjective experiences. The explanation no doubt lies in the differing spectrums of binding affinities to and activities at the various receptors in the brain. Because different receptor types have different physical distributions, different spectrums of binding affinities and activities will result in the alteration of activity patterns of different regions of the brain. Perhaps the most surprising implication of the phenethylamine data is that there is evidently a very high diversity of receptor types for these compounds in humans, thus allowing subtle and selective pharmacological manipulation of very many specific brain pathways.

Current research into the action of "hallucinogens" is based on the concept that they could be best understood if we can find a mechanism of action that is common to all hallucinogens (Titeler, Lyon, and Glennon, 1988):

> The phenylisopropylamine hallucinogens produce a syndrome that is apparently very similar to the spectrum of effects produced by LSD (Shulgin 1978). One strategy for uncovering a specific hallucinogenic site of action for LSD has been to identify a common site of action of the phenylisopropylamine hallucinogens and LSD.

While this approach has its value, it is based on a flawed assumption that these diverse compounds "produce a very similar syndrome" (paraphrasing). Any human who has experienced DOM, DOET, MDA, MDMA and 3,4,5-TMA (this author has not) can testify that these compounds exert radically different subjective effects. Yet, clearly there are some common features of these compounds that cause them to be subjectively recognized as "psychedelics" (this common feature is perhaps the uniquely human quality of the effects). Therefore it would not be surprising if many or most of them shared some common sites and mechanism of actions (presently, evidence from animal studies indicates that this commonality is agonism at the 5-HT_2 receptor). However, in humans at least, the commonality is more likely to lie in binding to a common family of receptors, rather than to a single common receptor.

I would like to suggest that this search for *the* mechanism common to all phenethylamines represents a failure to recognize a richer and much more interesting phenomenon: the dramatic differences in subjective effects exhibited by different phenethylamines. This failure may be due to the widespread but false belief that they "produce a very similar syndrome", a failure arising out of the paucity of good comparative human pharmacological studies. While there may be a receptor site such as 5-HT_2 that is bound by many phenethylamines, there must also be many other receptor sites that are affected differently by different compounds.

I would like to suggest an alternative research program focused on the diversity of mental effects. Ideally, we would like to characterize the physical distribution of every relevant receptor type in the brain, and then characterize the binding affinity and activity of every active phenethylamine at every receptor type. With this information, we could probe the brain with each phenethylamine, and correlate the subjective human experience with the physical structures and pathways excited or inhibited by that compound. In this way we could map the higher mental functions altered by phenethylamine to their underlying physical substrates.

Progress in this direction is obstructed by more than restrictions on experimentation in human subjects. The techniques used to determine the binding affinities and distributions of any class of chemicals in the brain simply can not be used in humans. These studies are always done with animals. However, animal studies will not allow us to sort out the interesting details of the diversity of mental actions of phenethylamines, because the relevant physical structures and receptor classes may not be present in animal brains.

It has already been suggested that one of the four recognized classes of serotonin receptors in rat brains, 5-HT_{1B} may not exist in humans. Also, it appears that there may be differences in the receptor currently most implicated in phenethylamine drug action, 5-HT_2, between the brains of humans and rats. Although this receptor bears the name 5-HT_2 which implies

that it is a receptor for serotonin, in fact it binds serotonin only weakly, suggesting that it may be a receptor for an as yet unknown neurotransmitter (Heym & Jacobs, 1987).

Many receptor molecules have now been studied in detail, and this work indicates that each receptor class corresponds to a unique protein. Closely related receptors differ by some amino-acid substitutions in the receptor protein. Each receptor class therefore is the product of a distinct gene within the genome.

The human genome project should ultimately generate a complete catalog of receptor classes from the human brain. It will then become possible to determine if there are receptor classes that are uniquely human. With the catolog of human receptors and genes available, it should be possible to manipulate the expression of the receptor genes in tissue culture, and test the binding affinities of the phenethylamines against the receptors in vitro. Once the distribution of these receptors in the brain is determined, the information would then be in place to complete the "ideal" research program discussed above.

This research program should allow what Shulgin has referred to as the "Fourier Transform" of mental states (Shulgin & Shulgin, 1991, p. 474-475):

> "A psychedelic drug experience is a complex combination of many signals going all at the same time. Something like the sound of an oboe playing the notes of the A-major scale. ...during the sounding of the note "A," for example, there is a complex combination of harmonics being produced at the same time... This mixture defines the played instrument as being an oboe.
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> This analogy applies precisely to the study of psychedelic drugs and their actions.... there are many components of a drug's action, like the harmonics from the fundamental to the inaudible which, taken in concert, defines the drug. With muscial instruments, these components can be shown as sine waves on an oscilloscope.... But in psychopharmacology? There is no psychic oscilloscope.... Certainly, any eventual definition of a drug will require some such dissection into components each of which makes some contribution to the complex whole. The mental process may some day be defined by a particular combination of these components."

This passage indicates that Shulgin considers that each phenethylamine has a unique spectrum of action, and that we need a "psychic oscilloscope" to characterize them. What is ironic is that he does not recognize that the instrument is at hand: the spectrum of binding affinities and actions at distinct receptor sites. This is the instrument he seeks. In this view, the purest psychic signal that could be induced chemically, consisting of a single "harmonic," would be produced by a chemical that bound exclusively to a single class of receptor. The finest chemical dissection of the psyche possible, involves interaction with a single receptor class.

Throughout Shulgin & Shulgin (1991) there is repeated discussion of structure activity relationships and their possible mechanisms (pp. 53-54, 68-69, 83, 585, 595, 615, 636, 644-646, 680, 691, 696-697, 708, 711, 839-840, 909). These discussions strike me as being

completely off-base and fruitless. I believe that the failure of these musings derives from what could be described as an "old-fashioned chemist mentality".

Most of this discussion reveals an unstated assumption that the mental activity is not the product of the activity of the compound itself, but of one of its metabolites, or perhaps even the process of metabolism itself. The concept that the effect is due to a metabolite rather than the compound itself reminds me of the panspermia hypothesis for the origin of life: that life did not originate on Earth, but came here through space from some other planet. This does not tell us how life originated, but simply moves the problem elsewhere.

To assume that the compound itself is active is not only more parsimonious, but is supported by a large body of evidence from animal studies. These studies indicate that phenethylamines bind with high affinity to specific receptors in the brain, and that they sometimes activate the receptor, and sometimes block the receptor (depending on which receptor and which compound).

Apart from the tendency to assign activity to a metabolite rather than the primary compound, Shulgin reveals little of his personal views on structure activity relationships in Shulgin & Shulgin (1991). However, in Shulgin (1983) he ventures his favorite speculation:

> The hows and whys of the action of this fascinating family of compounds is still a mystery, but some unorthodox speculations are tempting. Our cultural heritage requires the initial conclusion that these transient yet potentially enduring changes of states of consciousness are unnatural or abnormal. But perhaps they reveal the "normal" state through some disinhibition of an evolutionarily imposed safeguard. Perhaps these chemicals, by themselves, or through the *in vivo* conversion to some intrinsically appropriate metabolite, may serve a neurotransmitter role at some synaptic network, restoring certain neurological functions that have been lost through evolution. To many people, the states of awareness that are experienced are not "abnormal," but rather, familiar territory that had been lost in some primal amnesia.

The theory being advocated by Shulgin, is that there exist in the brain, certain inactive structures, that were active in our distant past, but which were inactivated through evolution. The idea is that when they were active, humans were mentally very different animals, very peaceful and comptemplative, perhaps like Christ and the Buddha. However, these mental states were not adaptive in the "cold cruel world", and were therefore eleminated by selection. Or more specifically, the natural neurotransmitters that activated these structures were eliminated, but the networks remained. Now when we ingest the appropriate chemicals, they play the role of the extinct transmitters, activating the still existant networks that generate the ancient mental states.

I find this theory unconvincing, because the supposed ancestral mental state would never have been selected for by Darwinian evolution in the first place, as it would never have been adaptive in the "cold cruel world". Such an evolution would have required that our ancestors evolved in some kind of benign garden of eden, for which there is only contrary

evidence. None-the-less, there remains the possibility that within the wide range of human genetic variation, there will appear individuals like Christ and the Buddha, whose mental makeup varies to these maladaptive extremes through chance rather than selection. The occasional presence of such individuals in cultures can have a tremendous impact, even if the vast majority of humanity is never able to achieve their level of enlightenment.

Summary of Structure Activity Relationships:

Below the chemical elements of structure activity relationships are briefly summarized, based on a survey of the human activity data presented by Shulgin:

The "ethylamine" side chain:

a) The ethylamine side chain can take the following forms: ethylamine or isopropylamine, and an OH group may or may not be placed on the nitrogen. Any other structure causes a drop-off in both quantitative and qualitative effectiveness.
b) The isopropylamine chain generally has a higher potency and longer duration than the ethylamine chain, however the ethylamine chain is generally found to be qualitatively superior and (at least in the case of the sulfur analogues) has a more consistent dose-response relationship.
c) The presence or absence of an OH group on the nitrogen has little effect on either quality or potency.

The phenyl ring:

a) The ring should have alkoxy and/or alkylthio substituents.
b) The greatest activity is found with two alkoxy-alkylthio substituents.
c) The two alkoxy-alkylthio substituents provide greatest activity if they are in the 2,5 or 2,6 positions.
d) The alkoxy-alkylthio substituents provide optimal activity if the alkyl group is a methyl. An ethyl group at the 5 position produces a potency similar to the methyl analogue, but shows a much longer duration (often too long). An ethyl group at the 2 position shows a decrease in potency and quality.
e) The 4 position should have a substituent other than H, and a very large variety of substituents are suitable. The substituient at this position is critical to both the quantitative and qualitative properties of the compound. Electro-negative groups at this position may enhance potency.

A Theory of Structure Activity Relationships:

Below is a discussion of a speculative theory of "what they do", reflecting on the structure activity observations summarized above. The theory will be based on several assumptions, which are certainly not embraced by Shulgin. These assumptions are the following:

a) The material is active in its original, un-metabolized form.
b) The potency of a material is proportional to its binding affinity at neurotransmitter receptors in the central nervous system (CNS).
c) The duration of a material is inversely proportional to its rate of metabolism.
d) The qualitative properties of a material depend on which suite of CNS receptors the

material binds to.

Consider that the human brain (like other brains) shows very elaborate physical specialization, in the sense that specific neurons or groups of neurons perform specialized functions. This is nicely illustrated by the mapping of sensory neurons onto the neocortex. In the somatosensory cortex, each point on the surface of the skin maps to a point on the surface of the cortex, and adjacent points on the skin map to adjacent points on the cortex. Thus there exist illustrations of this mapping in which a homunculus is drawn across the cortex.

Similarly, specialized language functions map to specific regions of the cortex: Broca's area, Wernicke's area, the arcuate fasciculus and the angular gyrus. While few have actually been mapped, it is reasonable to expect that a wide variety of uniquely human functions have speciaized, localized physical substrates in the brain.

The specialization of regions of the brain can manifest itself in many ways. There is evidence that much of the neocortex is uniform in that locally it has but one kind of circuitry, and the specializations of function derive from specialization of inputs and outputs. In this view, the auditory and visual cortex are structurally the same but differ primarily in the sensory modality of their inputs.

However, at a finer scale, specializations of specific neurons may be revealed by characteristic morphologies, characteristic firing patters (e.g., bursty or not), or in the chemistry of the transmitters they release or respond to. It is the chemical specialization that will be the focus here.

It is probably safe to say that in terms of gross morphological features, the human brain shows the greatest level of complexity and specialization of known brains. It seems likely that this observation could generalize to the level of chemical differentiation as well. What is being suggested is that the human brain may well have a more diverse system of chemical communication than the brains of any other species. It seems plausible as well, that any chemical communication systems that are uniquely human, are likely to be associated with mental functions that are uniquely human.

Chemical differentiation can be expressed in a variety of ways, but those that are relevant to this discussion are the differentiation of transmitter substances and receptors. If we were to visualize all cells of the brain which utilize a specific receptor or transmitter, we would see some kind of a functional unit, which conceivably may have a peculiar topology that would make it otherwise hard to recognize as an anatomical unit.

For example, these cells could occur together in a clump or tightly linked network, thereby forming a clearly defined anatomical structure. Alternatively they could be widely dispersed through the brain so that a visualization of these cells alone would take the form of an extremely thin array sparsely permeating the volume of the brain; and conceivably these cell might make no contacts among themselves, thus not forming a network on their own.

Regardless of the degree of anatomical cohesion of these chemically defined structures, it is likely that in many if not most cases, all cells that utilize a common chemical system represent some kind of functional unit. Thus chemistry provides an alternative method of dissecting functional units in the brain. Chemical definition can conceivably reveal functional

structures that would be virtually impossible to recognize through anatomical studies.

Chemical dissection has the rather unique advantage that through the use of drugs, it is possible to temporarily alter the activity of a chemical unit in an intact living brain, human or not. In addition, the physical structure of these chemical units can be mapped by the examination of the brains of cadavers. Thus by the combination of physical mapping of receptor distribution and the administration of receptor specific drugs, it is possible to associate physical chemical units with their functional significance through observation of the subjective effects of alterations in the activity of those units.

If it is true that there are chemical systems that are uniquely human, and that they are associated with uniquely human mental function, then identification of drugs that interact with those unique chemical systems would facilitate understanding of those systems. It would appear that phenethylamines may be such tools. A most interesting aspect of these drugs, as revealed through the work of the Shulgins, is their diversity of action. It appears that human subjects can discriminate dozens if not hundreds of phenethylamine compounds. Thus these compounds must interact differentially with a considerable number of underlying chemical functional units in the human brain.

The diverse tool kit of phenethylamines developed by the Shulgins can be used to reveal and explore the functional significance of those various chemical units that they interact with. The apparent ability of humans to distinguish qualitative differences between such a large number of phenethylamines, provides circumstantial evidence for the existance of a great diversity of chemical communication systems in the brain. The apparent lack of ability of rodents to discriminate these same materials, suggests that some of this apparent chemical diversification may be uniquely human.

Some Further Speculations:

One of the most intriguing aspects of the data presented in Shulgin & Shulgin (1991) is the "magic of the 4-position". If we take 2,5 or 2,6 - dimethoxy phenethylamine or phenylisopropylamine, and play with the 4-position, we get a wide variety of compounds with distinct effects. One possible explanation of this data would be the following:

The family of receptor sites to which the phenethylamines bind have evolved from a common ancestral receptor structure. Some regions of the binding site have been conserved in this evolution, and others have varied. The region of the binding site that has varied the most, aligns with the 4-position of the phenethylamine during binding. The remainder of the receptor binding site has been relatively conserved in evolution, and makes the best fit to the 2,5 or 2,6 - dimethoxy phenethylamine or phenylisopropylamine structure.

It has also been noted that alkylthio phenylisopropylamines show a lot of variability of effects between individuals. This suggests that there is genetic variation within the human population for the specific receptor classes that best bind these compounds. These are fairly wild speculations at this point. But they have the merit that they can eventually be tested when the catalog of human receptor types becomes available for study.

I would like to make an additional point here, about the exploration of qualitative variations. It can be tempting to pursue compounds that make one feel good. These are certainly

the ones that are likely to get the most use. However, one of the objectives of psychic exploration is to become more familiar with the components of the psyche, both positive and negative. It appears that Shulgin & Shulgin (1991) have been fairly unbiased in this respect. He describes Aleph-1 as producing "the most delicious blends of inflation, paranoia and selfishness" (p. 80). About 2C-E he said (p. 518):

> Several people have said, about 2C-E, "I don't think I like it, since it isn't that much fun. But I intend to explore it again". There is something here that will reward the experimenter.... let it rest as being a difficult and worth-while material. A very much worth-while material.

Perhaps the most negative compound explored is TMA. The original publication on TMA, Shulgin, Bunnell and Sargent (1961) provides this description:

> The emotional responses elicited during the period of maximum... intoxication... were striking in their intensity. Anger, hostility, and megalomaniac euphoria dominated the subject's thoughts and conversation. Actual acts of hostility were not observed, but it was felt that, in at least two subjects, provocation would have precipitated homicidal violence.

I have already quoted from Shulgin & Shulgin (1991) (p. 24) where Shulgin points out that the anger of TMA and the beauty of mescaline are not products of the drugs, but different aspects of the same unconscious, opened up by the drugs.

Finally, it is interesting to wonder at the (evolutionary) reasons for the apparent chemical diversity of the brain. The number of known neurotransmitters is in the dozens and growing rapidly. For each of the better studied neurotransmitters, there are several known classes of receptors. Why does the brain need more than two chemical communication systems: one excitatory, and one inhibitory (which could be accomplished with a single transmitter and two receptors)? And why does the brain need multiple receptors for each transmitter?

The chemical diversity suggests that patterns of interconnections alone are not enough to meet the information processing needs of the brain. Different chemical systems must have different information transmission properties. In addition, there may be means of globally affecting the activity of whole systems of neurons that use a common chemical messenger or receptor.

A New Vocabulary
A Review of PIHKAL

> "Gustav tends to sneer, but Saure [Bummer] really turns out to be an adept at the difficult art of papyromancy, the ability to prophesy through contemplating the way people roll reefers - the shape, the licking pattern, the wrinkles and folds or absence thereof in the paper. 'You will soon be in love,' sez Saure, 'see this line here.'
>
> "'It's long, isn't it? Does that mean - '
>
> "'Length is usually intensity. Not time.'
>
> ..."'How do you like this shit?' sez Saure.
>
> "'Hubsch,' allows Gustav. 'A trifle stahlig, and perhaps the infinitesimal hint of a Bodengeschmack behind its Korper, which is admittedly suffig.'
>
> "'I would rather have said spritzig,' Saure disagrees, if that indeed is what it is. 'Generally more bukettreich than last year's harvests, wouldn't you say?'
>
> "'Oh, for an Haut Atlas herbage it does have its Art, Certainly it can be described as kernig, even - as can often be said of that sauber quality prevailing in the Oued Nfis region - authentically pikant.'
>
> "'Acutally I would tend to suspect an origin somewhere along the southern slope of Jebel Sarho.' Saure sez - 'note the Spiel, rather glatt and blumig, even the suggestion of a Fulle in its wurzig audacity-'
>
> "'No no no, Fulle is overstating it, the El Abid Emerald we had last month had Fulle. But this is obviously more zart than that.'
>
> "The truth is they are both so blitzed that neither one knows what he's talking about..." Pynchon (1973, p. 442).

The book PIHKAL (Phenethylamines I Have Known And Loved), A Chemical Love Story, is unusual in that it combines under one cover, an auto-biographical novel about a love triangle, and 30 years of scientific laboratory notes. The entire package weighs in at a hefty 978 pages, and is not padded. The unusual presentation is a reflection of the subject matter: the chemistry of the human mind and the methodology of its exploration.

I consider the life work of Alexander (Sasha) Shulgin to represent one of the most significant scientific contributions of this century. I say this because he has perfected a methodology for the exploration of the chemistry of the human psyche, and he has used that methodology to generate a large set of chemical tools. These tools are non-invasive probes of the intact human mind.

This methodology violates all acceptable scientific procedures, and as such is at the root of the scientific advance that Shulgin's work represents. It is only when imaginative scientific individuals break free from scientific traditions that they cease to be builders and become architects. This is what underlies scientific revolutions. In spite of the revolutionary nature of

Shulgin's work, it will not incite a scientific revolution because in 1986 the methodology was prohibited by legislation at the national level in the United States. One can only speculate as to what might become of Shulgin's chemical tool set, if the use of psychedelics in research or therapy with human subjects should become accepted at some time in the future.

The Love Story

PIHKAL is divided roughly in half, into two books. "Book I, The Love Story", is an autobiographical novel about a love triangle. In contrast to Castenada's presentation of fantasy as fact, the Shulgins have chosen to present fact as fiction, evidently to protect the guilty. Under slightly altered names, the book details the paths that lead Sasha and Ann Shulgin to psychedelic drugs and to each other.

Having followed the work of Alexander Shulgin for over fifteen years, I was initially disappointed to discover that he had written less than a third of Book I. However, as I read the book, I came to realize that Ann writes with a greater openness and depth of feeling. This is not to say that Sasha can not show as much. In fact his discussion of his feelings regarding the death of his wife were remarkably open. However, we learn more about Sasha's personal life through Ann's voice than his own. On the whole, Book I is startling in how much it reveals of the personal life of the two Shulgins. Yet it must be remembered that this is a fictionalized autobiography, so any particular passage may be either fact or fiction.

Sasha never discusses sex, and his descriptions of drug experiences tend to be brief, clinical, and second or third person. Compare his less than one page description of his first psychedelic experience (mescaline, p. 16) to her twenty page description of her first experience (peyote, p. 111). While this distinction in their writing is generally true, there are exceptions. Sasha's description of his first 2C-E (p. 88) experience is impressive and fairly detailed, though it sounds unpleasant. On the other hand, in many of Ann's descriptions, the drug experience itself is in the background; it is just another thing going on in the story and is not presented in great detail. These discussions provide little insight into the unique properties of the compounds involved.

The ideal would be something like Naranjo (1973), which remains the best comparative study of psychedelics that I have seen. Naranjo treats four compounds (MDA, MMDA, harmaline and ibogaine) in detail, clearly characterizing the qualitative properties of each and differentiating between them. However, he devoted an entire book to these four compounds. In order for the Shulgins to provide equal detail for their hundreds of compounds, they would have to produce an encyclopedia, rather than a mere thousand page book.

Apart from providing relatively detailed descriptions of the subjective effects of a number of drugs whose effects have not previously been published, Book I provides a very vivid presentation of the methodology used to explore these materials. We meet the research group that tests the materials after Sasha has determined the effective dose range. They gather at the Shulgin's home, in a group of six or eight. Sasha describes what he knows of the new material and its dose range. Each person chooses their dose, and the material is dissolved in water or juice and taken in a toast. After the experience, each member of the group must submit a written description of the experience.

The selection of examples of drug experiences presented could not easily be construed to represent an attempt at drug advocacy. The examples include as many failures and frightening or unpleasant experiences as pleasurable ones. It is evident that it has taken considerable courage to personally test so many new and completely unknown compounds. The retrospective of thirty years of such research evidently indicates that no one in the research group suffered any harm from the experiments. However that outcome could not have been known in advance.

Book I describes two experiences in which it was feared that damage might have been done. Chapter 36 describes a group experiment in which one member became essentially catatonic for the duration of the effects of the drug. This caused considerable distress among the other members of the group who feared that the state may have been caused by neurological damage from this new and essentially unknown compound. However, as the effects of the drug wore off, the catatonic individual regained responsiveness, and reported "I was in the most amazing place,... beautiful,... an extraordinary experience,... truly fantastic".

Chapter 38 describes a "spiritual crisis", which began 24 hours after Ann took an inactive dose of a new compound. This crisis, is described in Book II as "a complex and psychologically disruptive syndrome... that lasted for the better part of a week" (p. 597). This is perhaps the most disturbing passage in the book, as it was a highly unusual experience, very much like being under the influence of a psychedelic drug, but continuously for a week, and evidently without the direct contribution of a psychedelic chemical. The implication is that extensive experimentation with psychedelics could make one susceptible to this kind of evidently uncontrolled and unwelcome experience. Although the term was not used, this experience could have been called a "flash-back". Not coincidentally, Chapter 37 discusses the phenomena of flash-backs.

Another interesting aspect of Book I is the elucidation of how Sasha Shulgin was able to pursue such an unusual career. He began working with psychedleics while employed as a chemist at "Dole" chemical company. Eventually the company began to frown on the work, and he chose to leave the company to become a free-lance chemist-consultant. He is an analytical chemist with a federal license to work with all scheduled drugs. His consultant work includes serving as a witness in court cases concering drugs.

In addition to his decision to leave the company and become independent, he also made a decision not to take his work underground. He has continued to publish much of his work over the years in various scientific publications, now totaling over 160 articles, patents, chapters and books.

The Chemical Story

"Book II, The Chemical Story" is the compilation of thirty years of Alexander Shulgin's lab notes. It begins with an index listing 179 phenethylamines. Book II represents a very bold program of chemical exploration. The kinds of functional groups and hetero-atoms placed on the basic psychedelic phenethylamine skeleton, particularly in the 4-position, are

very diverse. The use of halogens, sulfur, triple-bonds, cyclopropyl groups, nitro groups, and even a selenium atom indicate a willingness to try just about anything. While there are many compounds that suggest a sort of turning over of stones approach, there are also instances of systematic exploration of structure - activity relationships.

In some cases it is clear that the synthesis got too far ahead of the testing. Book II opens with a chemical joke consisting of wild speculation of structure activity relationships. However, underlying the joke is the fact that eight analogs in the wildly speculative logical series were synthesized or begun before the fallacy of the enterprise was recognized. There seems to have been some mania for synthesis. However, that series was synthesized at the beginning of the work, about thirty years ago when Shulgin was relatively naieve about structure activity relationships and inexperienced with psychedelics.

For each of these 179 compounds, there is a separate entry in Book II, generally consisting of five parts: Synthesis, Dosage, Duration, Qualitative Comments, and Extensions and Commentary.

Synthesis

Book II contains explicit and detailed descriptions of the synthesis of each of the phenethylamines discussed in the book. The recipes are clear and complete. They include considerable discussion of how to isolate and purify the intermediate reaction products and the final product; critical information often lacking from such recipies. It should be possible to synthesize any of the materials discussed in the book from the information given, however, this would also require an experienced chemist working in a well equiped lab. I raise this issue because the book is published as a non-techinical "popular" work (having already sold over ten thousand copies). However, the syntheses could not be completed by most readers.

Some examples of procedures that clearly require a fully equipped lab follow: A typical synthesis works up the appropriately substituted nitrostyrene or nitropropene, which is sometimes a long procedure. This product is then reduced with lithium aluminum hydride in a diethyl ether solution under a helium atmosphere. Intermediate products are often purified by distillation under a vacuum. Some reactions generate noxious gasses such as hydrogen sulfide, hydrogen chloride, or hydrogen cyanide. In some reactions, special care had to be taken to avoid an explosion risk. One synthesis reports that an intermediate product detonated spontaneously after sitting for a few days.

Dosage & Duration

Each of these are one liners, for example:
DOSAGE: 4 – 8 mg
DURATION: 8 – 16 h.

Qualitative Comments

This section consists of a series of paragraphs describing the subjective effects of the compound. Each paragraph begins with a dosage, and successive paragraphs generally represent larger dosages, spanning the full effective dose range of the compound. The paragraphs are largely gleaned from the notes contributed by members of the research group.

Extensions and Commentary

This section is where comments are made about the effects of specific compounds which go beyond simple descriptions of the effects. The effects of different compounds are compared, and speculations about structure activity relationships appear. Often this sections presents sub-recipes, including the complete synthesis, dosage, duration and qualitative effects of additional compounds related to the title compound.

The extensions and commentary include considerable discussions of the system used to name the psychedelic compounds, and also introduces some basic principles of psychedelic chemistry: There is a discussion of sulfur - oxygen chemistry on pages 856-857, and a discussion of the essential oils and related psychedelics on pages 860-864. All and all, I found the extensions and commentary to be the most interesting part of PIHKAL.

Critical Points:

While I have great admiration for the accomplishments of the Shulgins in exploring the chemistry of the mind, reviewing the book brings up two points which I find irritating: 1) Exploration of many of the materials was abandoned at low levels, indicating an emphasis on potency not quality. 2) The book is permeated with an "old-fashioned chemist mentality" towards structure activity relationships, which ignores the understanding that can be gained from viewing activity as based on an interaction between the molecules and neurotransmitter receptors in the brain. The issue of structure activity relationships is dealt with in the scientific response above, while the potency not quality issue is dealt with below.

Just how many phenethylamines are there? This is an ambiguous and unanswerable question. The more relevant question is: how many psychedelic phenethylamines are there? This is still not known, but the question that we can address, is: how many potentially active phenethylamines are known, and what is their status? The index on pages 453-457 lists 179 phenethylamines. However, study of the 179 "recipes" reveals that many of them describe more than one compound. Generally, under a single recipe, data will be presented on closely related materials. A list was made of all phenethylamines discussed in Book II, for which there was presented at least either the synthesis, or data on activity in humans, or a separate recipe (Table 1, at the end of this document). This exercise turned up 311 compounds.

Table 1 contains a "status" column, in which each of the 311 compounds was classified into one of the following categories:

U) Untasted: has been synthesized, but not tested in humans.

S) Sub-threshold: psychedelic activity has not been demonstrated, however, the compound has not been tested up to the 200 mg level. Mescaline is considered active at the 200-400 mg level. Mescaline is a highly rated compound, considered among the top five phenethylamines, based on its qualitative properties (p. 570). Yet mescaline is also the least potent phenethylamine still considered to be active. For this reason, in this classification, human titrations are not considered complete unless they have shown either activity, signs of toxicity, or they have gone up to at least the 200 mg level.

T) Threshold: the compound was tasted only to threshold levels, thus it has not been possible to characterize the psychedelic properties.
X) Toxic: signs of toxicity appear at dosage levels below which psychedelic activity appears.
P) Physical more than mental: the compound is psychedelic, but generates unpleasant physical symptoms which are considered to not be adequately compensated for by the mental effects.
A) Active: clearly shows psychedelic activity.
N) Not active: the compound has been tested up to at least the 200 mg level, and no activity has been found.
O) Other than psychedelic activity: other than psychedelic activity has been demonstrated. These "other" activities include such things as: anti-depressant, analgesic, anorexic, adrenergic bronchodilator, stimulant and antitussive.
I) Incomplete synthesis: the synthesis is described, but it has not been completed, thus the final phenethylamine is not yet available for study.
?) Status unknown: the compound appears in the book, but there is no statement as to the status, it is probably untested.

The distinction between categories X and P is subtle and perhaps not meaningful. It is based on the wording presented in the description of the effects. Sometimes it is explicitly stated that a material is believed to be toxic, and these compounds are classified as X. Other descriptions report a body load that is greater than the mental effects, and these are classified as P.

The counts of compounds in each of the categories are summarized in Table 2 below:

U)	71	Untasted
S)	51	Sub-threshold
T)	31	Threshold
X)	2	Toxic
P)	11	Physical more than mental
A)	107	Active
N)	25	Not active
O)	8	Other than psychedelic activity
I)	2	Incomplete synthesis
?)	3	Status unknown

It seems a pity that there are a total of 153 compounds in the combined U, S, and T categories. The large number of untasted compounds is due in part to the fact that some of these compounds were developed as potential brain imaging compounds, and were never intended to be psychedelics, and so have not been tasted. However, these account for less than half of the U category.

What is the most frustrating is the S category (and to a lesser extent the T category), where it seems that the tasting efforts were aborted at sometimes absurdly low levels. Here we must recognize that Sasha Shulgin has chosen to test all compounds on himself before exposing other humans to the materials. This is a comendable practice, but it leads to the problem of "so many phenethylamines, so little time".

It appears that there is yet another reason why many compounds were only titrated to very low levels. Many compounds were synthesized as variations on known active compounds. They were then titrated up to the level at which the model compound showed activity. If they were not active at that level, titration was stopped. This indicates that in this work, there was a greater emphasis on potency than on the qualitative properties of the compounds. There may be many mescalines or MDMAs (ecstacy) among these sub-threshold compounds; materials which show marvelous activity at much higher doses than have been tested.

It would be interesting to know the dates of synthesis and testing of these materials. I suspect that much of the earlier work placed a great emphasis on potency, while in his later work, he has shown a greater interest in quality. For example, the 2C compounds are generally less potent but qualitatively better than the 3C compounds. Yet much of the work on the 2C compounds has evidently been in the last ten years. Shulgin (1983) describes this changing focus in his own words:

> Throughout this early work, I was absorbed primarily with how much of a chemical it took to achieve an effect, rather than with the nature of the effect achieved. In my notes the term "psychedelic effectiveness" reflected only the potency. I left to others the task of determining the qualitative aspects of the effects of these drugs, and their potential values. It was around this time that I became aware that I was trying to answer a complex question with a hopelessly restricted vocabulary....
>
> A modest wealth of discovery in several research environments throughout the world began uncovering the generality of psychedelic drug structures and, much more important to the studies that stemmed from this, a wealth of qualitative distinctions and values which can be found within them.
>
> Here was the start of my quest of caring. I began the study of these drugs, not from the viewpoint of classification and simple assignment of potency, but inquiring into the values of human interaction that can result from their study in terms of personal development. I became aware that it was of little merit merely to observe what a drug does to the human nervous system, unless one also observes how it permits a person to interact with others, and especially, how it allows him to acknowledge himself....
>
> Now, the quest is assuming a different character. There is a need for integration. There are literally hundreds of psychedelic "catalysts" currently at hand that run the gamut of potencies and qualitative characteristics. But now it is becoming apparent to me that these materials, rather than being simply flowers in an expanding anthology, could have value beyond their present acceptance as sensory disinhibitors.

While it is a great shame that the titration of so many materials was abandoned simply because they were less potent than the compound they were considered an analog to, there are good reasons to seek more potent compounds:

The ideal psychedelic would have its direct effect only on the central nervous system, showing no activity in the peripheral nervous system. However, in the real world, any random phenethylamine is likely to have some level of affinity for binding at receptors in the peripheral nervous system. Given that some such affinity may be present, the greater the dose that is put into the system, the more likely that peripheral effects will manifest themselves. Therefore the most potent materials stand the best chance of having nearly pure CNS activity.

Another reason for seeking potency is that once a number of extremely potent compounds are known, their structures can be freely varied in search of qualitative properties. Variations on the structure of highly potent compounds are likely to result in a loss of potency, but when you start from such a height of potency, there is a lot of room to drop. This makes it possible to more freely explore qualitative variations, with less chance of varying into an inactive structure.

So Many Phenethylamines, So Little Time...
A Guide to PIHKAL

Those of you who enjoyed PIHKAL are no doubt looking forward to the publication of TIHKAL (tryptamines I have known and loved), dealing with the indole based psychedelics. An interesting twist on the indole story is the concept of the indole polymer. These have also been developed and experimented with, producing some interesting results, most notoriously Imipolex. One experimental subject reports:

> "They took away my clothes and dressed me in an exotic costume of some black polymer, very tight at the waist, open at the crotch. It felt alive on me. 'Forget leather, forget satin,' shivered Drohne. 'This is Imipolex, the material of the future.' I can't describe its perfume, or how it felt - the luxury. The moment it touched them it brought my nipples up swollen and begging to be bitten. I wanted to feel it against my cunt. Nothing I ever wore, before or since, aroused me quite as much as Imipolex. They promised me brassieres, chemises, stockings, gowns of the same material. Drohne had strapped on a gigantic Imipolex penis over his own. I rubbed my face against it, it was so delicious.... There was an abyss between my feet. Things, memories, no way to distinguish them any more, went tumbling downward through my head. A torrent. I was evacuating all these, out into some void ... from my vertex, curling, bright-colored hallucinations went streaming ... baubles, amusing lines of dialogue, objects d'art ... I was letting them all go. Holding none. Was this 'submission,' then - letting all these go?" Pynchon (1973, p. 488).

Because PIHKAL is so large, I would like to assist readers who have less time to invest by making available some of the fruits of my careful reading, in the form of a sort of index to things that I found interesting in the book:

Many readers will want to know which of the 311 compounds presented are the "best". Early in his career, Sasha classified compounds as better if they were more potent, regardless of their qualitative effects. Perhaps he has mellowed with age, or perhaps he has become more honest. On page 570, he lists what he considers the five top phenethylamines, based on "their acceptability and their intrinsic richness". They are: 2C-T-7, 2C-T-2, 2C-B, mescaline and 2C-E. Interestingly, all of them are quite literally phenethylamines. That is, none of them are phenylisopropylamines. It is not clear if the list was meant to be restricted to phenethylamines, or if none of the phenylisopropylamines made it into the list of the top five.

Descriptions of Drug Experiences in Book I

p. 11-13 his first drug experience: morphine
p. 15-17 his first mescaline experience, description in < 1 page, actually a distillation, not a moving description, but a strong one.

p. 22-25 TMA: "mescaline no more produced beauty than TMA produced anger. Just as the beauty was always within me, so was the anger. Different drugs may sometimes open different doors in a person, but all of those doors lead out of the same unconscious."
p. 34-39 MMDA: a description of the experience by "a poet". I find the description to be "new age" and uninformative.
p. 51-52 MEM: a very powerfull account of a signinficant therapeutic effect on a woman whom he used it with.
p. 54-56 DOM: completely clinical description of the drug, except for a three line quote at the end of the chapter.
p. 69-74 MDMA: the description of therapeutic benefits are convincing but detached, 2nd person.
p. 75-79 MDOH-MDA-marijuana combination: Time-Stop. Fairly detailed but clinical description. He was frightened, sounds unpleasant.
p. 81-87 Aleph-1: his 1st person present tense narative, the written notes from the experience. But they sound rather crazy. "the most delicious blends of inflation, paranoia and selfishness".
p. 88-97 2C-E: and death of wife. This section is written with a great deal of honesty. The description of 2C-E is impressive and fairly detailed, but sounds unpleasant.
p. 92 describes three trips that were utter failures.
p. 111-131 peyote: she describes peyote with much personal intimacy & detail. 20 pages! compared to his 1 page distillation on p. 16-17.
p. 192-203 MDMA: 11 pages, her first person present narrative. There is a lot of talk by him. We learn more about his marriage than he told us in his own voice.
p. 210-217 Aleph-2: she didn't get off, so it not a very exciting description. But this is the first description of the group.
p. 219-222 2C-B: the description is not very intriguing, given that this is one of the "best" materials. Shows that one can have sex with it.
p. 224-229 DOM: again, not a remarkable drug description. The narration is more about their experiment with bondage. It occurs to me that he never discussed sex in his own voice, but she does a lot.
p. 233-239 psilocybine: not a phenethylamine, a decent description of the experience.
p. 248 MDMA: used to defeat "Siberian wastelands", only a mention.
p. 260 Mescaline: a group experiment at high dose. The narrative left me feeling like an outsider to the experience.
p. 283-285 2C-T-2: a fairly shallow description, focused on the sexual
p. 288-296 DOB: some initial stoned thoughts, some sex, some conversation. Little real sense of what the drug does.
p. 303-306 MDMA: a rather remarkable experience in which her anger about loosing Shura to Ursula was interrupted by a voice telling her that Shura would be hurt and would need her. This proved to be true.
p. 323-329 LSD: some sense of imagery, sex, conversation, but the drug still seems to be in the background.
p. 340-344 2C-I: this is one of the better descriptions. She describes an interesting sensation of the city of Aachen, and some interesting imagery. They have sex.
p. 346-357 5-TOM: this was a fairly detailed group experiment, but a shallow material. One

group member went catatonic, causing a scare.
p. 393-395 MDMA: rather brief description of the experience. Provided relief from a spiritual crisis. There was a lucid dream that night.
p. 408 2C-B: very brief description, had sex and talked
p. 411-418 2C-T-7: a really phenomenal and detailed description by a third party.
p. 421-427 2C-E: a detailed description of a very unpleasant experience.
p. 428-433 2C-T-4: a very nice and detailed description.
p. 433 2C-B, 2C-T-4 combination, two sentences.

Discussions of Drug Combinations

p. 75-79 MDOH-MDA-marijuana combination: Time-Stop. Fairly detailed but clinical description. He was frightened, sounds unpleasant.
p. 433 2C-B, 2C-T-4 combination, two sentences.
p. 471 Aleph-6 - LSD - marijuana combination
p. 497 "pro-drug"
p. 730-733 "piggy-back", "primer" experiments
p. 753 MDPR - LSD, "body window"
p. 755 MDMA - LSD "piggyback"
p. 758 "tomoso" effect
p. 767-769 MEM - MDMA
p. 775 Methyl-DMA - MDMA
p. 777-778 Methyl-DOB - Psilocybine
p. 778 potentiation
p. 892 TMPEA - mescaline
p. 909 TOMOSO effect, more metabolic babble
recipe #20 2C-B - MDMA

Discussions of Structure - Activity Relationships

p. 53-54 discussion of a structure activity experiment in which the data support a receptor rather than metabolic hypothesis.
p. 68-69 the quinone $->$ indole hypothesis of activity.
p. 83 RS $->$ HS assumption of metabolism to explain activity.
p. 356-357 assumption of activity through metabolism
p. 474-475 Beth state, "Fourier Transform" of mental states
p. 585 north & south end of receptor
p. 595 assumption of activity related to metabolism
p. 615 DMPEA: and the "pink spot"
p. 636 discussion of sub-classes of 5HT receptors
p. 644-646 hydroquinone hypothesis
p. 680 assumption that DOM is active through metabolites
p. 691 activity through metabolism
p. 696-697 discussion of receptor subclasses, chemical classes, "what are they", "where do they go", $->$ "what do they do"
p. 708 a chemical hypothesis of activity through metabolism, this one relates to amphetamine psychosis, and is obsolete in the light of Jacob's studies

p. 711 more speculation about activity requiring metabolism
p. 839-840 the fallacy of predicting potency by structure
p. 909 TOMOSO effect, more metabolic babble

Miscellaneous:

p. 55 "rubby" teeth defined
p. 60-65 describes his decision to do his work above ground rather than underground.
p. 67-68 encounter between Schultes and Naranjo.
p. 361 discussion of flashbacks.
p. 459 1st commentary, crazy fantasy, untasted material
p. 459, 750-751 crazy logic
p. 464 ego inflation & mania, ch 14
p. 466 high variability of S amphetamines
p. 474-475 Beth state, "Fourier Transform" of mental states
p. 479-480 ten classic ladies
p. 486-487 N-methyl not good (Contrary to MDMA) example of suspected toxicity.
p. 490-492 examples of suspected toxicity
p. 494 BOX series, relation to norepinephrine
p. 498 beta-ethanolamines
p. 514 Tweetios
p. 566-567 pseudo "next 10 years" of psychedelics
p. 570 5 top phenethylamines: 2C-T-7, 2C-T-2, 2C-B, 2C-E, mescaline
p. 534 "record breaking" length x potency
p. 588 most potent phenethylamine
p. 636 discussion of sub-classes of 5HT receptors
p. 649 an hypnogogic compound
p. 664-671 F-2, F, F-22: these were only run up to the 15 mg range. A pity, they might show interesting activity at ten times the dose.
p. 673 HOT compounds N-OH
p. 676 G-4: The compound is listed even though its synthesis is not complete. There are other examples of this in the book.
p. 676 "for a period of time (about 3 years) by which time..." Is this a joke?
p. 682 HOT
p. 686-687 the value of a long experience
p. 696 IRIS assayed only to 9 mg level "since DOM itself would have been smashingly active at this level". Did he not care about qualitative effects at this time?
p. 750-751, 459 crazy logic
p. 752 triple bond in phenethylamine
p. 764 good Twain quote: "I like science because it gives one such a wholesome return of conjecture from such a trifling investment of fact."
p. 768 why emphasize potency
p. 774 rabbit recta
p. 784 Doonesbury - designer drugs, analog drug act
p. 786 austronauts of inner space
p. 802 killing mice

p. 808-809 MPM, MIPM, MBM, and MAM were only assayed to levels that showed them to be less active than MEM. This did not allow characterization of their qualitative properties. Too much interest here in quantitative.
p. 814 PE is assayed to the 150 mg level. Why? when other compounds were assayed to much lower levels.
p. 822 explanation of specific meaning of dosage above some value
p. 824 spontaneous detonation after standing for a few days (in synthesis).
p. 836-837 non-psychedelic euphoriant
p. 843 here there is a foreward to the synthesis, but not very interesting
p. 856-857 discussion of S, O chemistry
p. 860-864 the essential oils
p. 867-868 deterioration of Science & Nature
p. 869 another definition of <
p. 879 a statement of an intent to base all syntheses on starting from commercially available materials. Then he goes on to express paranoia that some of these will become unavailable due to the WOD, so the present synthesis is based on a natural product.
p. 896 a lucid explanation of why human titration was abandoned due to physical effects.
p. 902 example of synthesis describing alternate route that does not work well.
p. 920 "what this book is all about" quality not quantity

References

> "Felipe is kneeling out in the sun, making his noontime devotionals to the living presence of a certain rock back in the wasteland of La Rioja, on the eastern slopes of the Andes. According to an Argentine legend from the last century, Maria Antonia Correa followed her lover into that arid land, carrying their newborn child. Herders found her a week later, dead. But the infant had survived, by nursing from her corpse. Rocks near the site of the miracle have since been the objects of yearly pilgrimages. But Felipe's particular rock embodies also an intellectual system, for he believes (as do M. F. Beal and others) in a form of mineral consciousness not too much different from that of plants and animals, except for the time scale. Rock's time scale is a lot more stretched out. 'We're talking frames per century,' Felipe like everybody else here lately has been using a bit of movie language, 'per millennium!' Colossal. But Felipe has come to see, as those who are not Sentient Rocksters seldom do, that history as it's been laid on the world is only a fraction, an outward-and-visible fraction. That we must also look to the untold, to the silence around us, to the passage of the next rock we notice - to its aeons of history under the long and female persistence of water and air (who'll be there, once or twice per century, to trip the shutter?), down to the lowland where your paths, human and mineral, are most likely to cross...." Pynchon (1973, p. 612-613).

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A Table of 311 Phenethylamines

Shulgin crossed the diamond with the pearl and gave birth to all forms of light:

> "It is early morning now. Slothrop's breath is white on the air. He is just up from a dream. Part I of a poem, with woodcuts accompanying the text - a woman is attending a dog show which is also, in some way, a stud service. She has brought her Pekingese, a female with a sickeningly cute name, Mimsy or Goo-Goo or something, here to be serviced. She is passing the time in a garden setting, with some other middle-class ladies like herself, when from some enclosure nearby she hears the sound of her bitch, coming. The sound goes on and on for much longer than seems appropriate, and she suddenly realizes that the sound is her own voice, this interminable cry of dog-pleasure. The others, politely, are pretending not to notice. She feels shame, but is helpless, driven now by a need to go out and find other animal species to fuck. She sucks the penis of a multicolored mongrel who has tried to mount her in the street. Out in a barren field near a barbed-wire fence, winter fires across the clouds, a tall horse compels her to kneel, passively, and kiss his hooves. Cats and minks, hyenas and rabbits, fuck her inside automobiles, lost at night in the forests, out beside a waterhole in the desert.
>
> "As Part II begins, she has discovered she's pregnant. Her husband, a dumb, easygoing screen door salesman, makes an agreement with her: her own promise is never stated, but in return, nine months from now, he will take her where she wants to go. So it is that close to the end of her term he is out on the river, and American river, in a rowboat, hauling on the oars, carrying her on a journey. The key color in this section is violet.
>
> "Part III finds her at the bottom of the river. She has drowned. But all forms of life fill her womb. 'Using her as mermaid' (line 7), they transport her down through these green river-depths. 'It was down, and out again./ Old Squalidozzi, ploughman of the deep,/ At the end of his day's sowing/ Sees her verdigris belly among the weeds' (lines 10-13), and brings her back up. He is a classically-bearded Neptune figure with an old serene face. From out of her body streams a flood now of different creatures, octopuses, reindeer, kangaroos, 'Who can say all the life/ That left her womb that day?' Squalidozzi can only catch a glimpse of the amazing spill as he bears her back toward the surface. Above, it is a mild and sunlit green lake or pond, grassy at the banks, shaded by willows. Insects whine and hover. The key color now is green. 'And there as it broke to sun/ Her corpse found sleep in the water/ And in the summer depths/ The creatures took their way/ Each to its proper love/ In the height of afternoon/ As the peaceful river went...."' Pynchon (1973, p. 446-447)

STATUS:

A active
T only threshold levels were tasted
S only sub-threshold levels tasted
U untasted
N not active
X signs of toxicity below active level
P physical more than mental
O other, non-psychedelic activity
F synthesis not finished

Abbreviations:

A   = amphetamine
PEA = phenethylamine
B   = butane
MDP = methylenedioxyphenyl

Note that dosages listed for T, S and N categories indicate what levels these compoun

#	Code	Status	Dosage	Compact chemical name
1	AEM	S	220	alpha-Ethyl-3,4,5-trimethoxy-PEA
1	APM	U		alpha-Propyl-3,4,5-trimethoxy-PEA
1	ABM	U		alpha-Butyl-3,4,5-trimethoxy-PEA
1	AAM	U		alpha-Amyl-3,4,5-trimethoxy-PEA
2	AL	A	20-35	4-Allyloxy-3,5-dimethoxy-PEA
3	ALEPH	A	5-10	4-Methylthio-2,5-dimethoxy-A
4	ALEPH-2	A	4-8	4-Ethylthio-2,5-dimethoxy-A
5	ALEPH-4	A	7-12	4-Isopropylthio-2,5-dimethoxy-A
6	ALEPH-6	A	>40	4-Phenylthio-2,5-dimethoxy-A
7	ALEPH-7	A	4-7	4-Propylthio-2,5-dimethoxy-A
8	ARIADNE	O	12-32	2,5-Dimethoxy-alpha-ethyl-4-methyl-PEA
8	?	U		1-(2,5-dimethoxyphenyl)-2-aminobutane
8	?	U		1-(3,4-dimethoxyphenyl)-2-aminobutane
8	?	U		1-(2,5-dimethoxy-4-bromophenyl)-2-aminobutane
8	?	U		N,N-dimethyl-1-(2,4-dimethoxyphenyl)-2-aminobutane
8	?	U		N,N-dimethyl-1-(2,5-dimethoxyphenyl)-2-aminobutane
8	?	U		N,N-dimethyl-1-(3,5-dimethoxyphenyl)-2-aminobutane
8	?	U		1-(2,5-dimethoxy-4-methylphenyl)-N-hydroxy-2-aminoB
8	?	U		1-(2,4,6-trimethoxyphenyl)-2-aminobutane
8	?	U		3,6-dimethoxy-2,4-dimethyl-A

9	ASB	A	200-280	3,4-Diethoxy-5-methoxy-PEA
10	B	P	>150	4-Butoxy-3,5-dimethoxy-PEA
11	BEATRICE	P	>30	2,5-Dimethoxy-4,N-dimethyl-A
11	?	U		N-Cyclopropyl-2,5-dimethoxy-4-methyl-A
12	BIS-TOM	X	160	2,5-Bismethylthio-4-methyl-A
13	2C-BIS-TOM	U		2,5-Bis-(methylthio)-4-methylphenethylamine
13	BOB	P	10-20	4-Bromo-2,5,beta-trimethoxy-PEA
14	BOD	A	15-25	2,5,beta-Trimethoxy-4-methyl-PEA
14	BOED	A	70-75	2,5-Dimethoxy-beta-ethoxy-4-methyl-PEA
15	BOH	P	80-120	beta-Methoxy-3,4-methylenedioxy-PEA
16	BOHD	X	50	2,5-Dimethoxy-beta-hydroxy-4-methyl-PEA
17	BOM	S	200	3,4,5,beta-Tetramethoxy-PEA
18	4-Br-3,5-DMA	O	4-10	4-Bromo-3,5-dimethoxy-A
19	2-Br-4,5-MDA	S	350	2-Bromo-4,5-methylenedioxy-A
20	2C-B	A	12-24	4-Bromo-2,5-dimethoxy-PEA
20	2CB-2ETO	A	15-50	4-Bromo-2-ethoxy-5-methoxy-PEA
20	2CB-2,5-DIETO	S	50	4-Bromo-2,5-diethoxy-PEA
20	6-BR-DMPEA	A	60iv	2-Bromo-4,5-dimethoxy-PEA
20	?	A	>60iv	N-Methyl-2-bromo-4,5-dimethoxy-PEA
21	3C-BZ	A	25-200	4-Benzyloxy-3,5-dimethoxy-A
21	3C-FBZ	S	4	3,5-Dimethoxy-4-(4-fluorobenzyloxy)amphetamine
22	2C-C	A	20-40	4-Chloro-2,5-dimethoxy-PEA
22	2C-CN	U		2,5-Dimethoxy-4-cyano-PEA
22	2C-COOH	U		2,5-Dimethoxy-4-carboxy-PEA
23	2C-D	A	20-60	4-Methyl-2,5-dimethoxy-PEA
23	?	U		4,N-dimethyl-2,5-dimethoxy-PEA
23	?	U		4,N,N-trimethyl-2,5-dimethoxy-PEA
23	2CD-2ETO	A	60	2-Ethoxy-5-methoxy-4-methyl-PEA
23	2CD-5ETO	A	40-50	5-Ethoxy-2-methoxy-4-methyl-PEA
23	2CD-2,5-DIETO	T	55	2,5-Diethoxy-4-methyl-PEA
24	2C-E	A	10-25	4-Ethyl-2,5-dimethoxy-PEA
24	2CE-5ETO	A	10-15	5-Ethoxy-4-ethyl-2-methoxy-PEA
25	3C-E	A	30-60	4-Ethoxy-3,5-dimethoxy-A
26	2C-F	S	250	4-Fluoro-2,5-dimethoxy-PEA
26	DOF	U		4-Fluoro-2,5-dimethoxy-A
27	2C-G	A	20-35	3,4-Dimethyl-2,5-dimethoxy-PEA
28	2C-G-3	A	12-24	3,4-Trimethylene-2,5-dimethoxy-PEA
29	2C-G-4	I		3,4-Tetramethylene-2,5-dimethoxy-PEA
30	2C-G-5	A	10-16	3,4-Norbornyl-2,5-dimethoxy-PEA
31	2C-G-N	A	20-40	1,4-Dimethoxynaphthyl-2-ethylamine
32	2C-H	U		2,5-Dimethoxy-PEA
33	2C-I	A	14-22	4-Iodo-2,5-dimethoxy-PEA
33	2CI-2ETO	A	5-50	2-Ethoxy-4-iodo-5-methoxy-PEA
34	2C-N	A	100-150	4-Nitro-2,5-dimethoxy-PEA
35	2C-O-4	T	60	4-Isopropoxy-2,5-dimethoxy-PEA

36	2C-P	A	6-10	4-Propyl-2,5-dimethoxy-PEA
37	CPM	A	60-80	4-Cyclopropylmethoxy-3,5-dimethoxy-PEA
38	2C-SE	T	50-70	4-Methylseleno-2,5-dimethoxy-PEA
39	2C-T	A	60-100	4-Methylthio-2,5-dimethoxy-PEA
39	2CT-2ETO	T	50	2-Ethoxy-5-methoxy-4-methylthio-PEA
39	2CT-5ETO	A	30	5-Ethoxy-2-methoxy-4-methylthio-PEA
40	2C-T-2	A	12-25	4-Ethylthio-2,5-dimethoxy-PEA
40	2CT2-2ETO	A	50	2-Ethoxy-4-ethylthio-5-methoxy-PEA
40	2CT2-5ETO	A	20	5-Ethoxy-4-ethylthio-2-methoxy-PEA
40	2CT2-2,5DIETO	A	10-50	2,5-Diethoxy-4-ethylthio-PEA
41	2C-T-4	A	8-20	4-Isopropylthio-2,5-dimethoxy-PEA
41	2CT4-2ETO	A	10-25	2-Ethoxy-5-methoxy-4-(i)-propylthio-PEA
42	pseudo-2C-T-4	T	8-12	4-Isopropylthio-2,6-dimethoxy-PEA
43	2C-T-7	A	10-30	4-Propylthio-2,5-dimethoxy-PEA
43	2CT7-2ETO	A	20	2-Ethoxy-5-methoxy-4-(n)-propylthio-PEA
43	METHYL-2C-T-7	U		2,5-Dimethoxy-4-(n)-propyl-N-methyl-PEA
44	2C-T-8	A	30-50	4-Cyclopropylmethylthio-2,5-diimethoxy-PEA
45	2C-T-9	A	60-100	4-(t)-Butylthio-2,5-dimethoxy-PEA
46	2C-T-13	A	25-40	4-(2-Methoxyethylthio)-2,5-dimethoxy-PEA
47	2C-T-15	T	30	4-Cyclopropylthio-2,5-dimethoxy-PEA
48	2C-T-17	A	60-100	4-(s)-Butylthio-2,5-dimethoxy-PEA
49	2C-T-21	A	8-12	4-(2-Fluoroethylthio)-2,5-dimethoxy-PEA
50	4-D	A	200-400	4-Trideuteromethyl-3,5-dimethoxy-PEA
51	beta-D	A	200-400	beta,beta-Dideutero-3,4,5-trimethoxy-PEA
52	DESOXY	T	40-120	4-Me-3,5-Dimethoxy-PEA
53	2,4-DMA	T	60	2,4-Dimethoxy-A
54	2,5-DMA	P	80-160	2,5-Dimethoxy-A
54	?	S	150	2,5-Dimethyl-A
54	?	O	10	3,4-Dimethyl-A
54	?	O	75-150	2-Methyl-A
54	?	O	75-150	3-Methyl-A
54	?	P	75-150	4-Methyl-A
54	2,5-DNNA	U		2,5-Dimethoxy-N,N-dimethyl-A
54	IDNNA	U		4-Iodo-2,5-dimethoxy-N,N-dimethyl-A
54	FDNNA	U		4-Fluoro-2,5-dimethoxy-N,N-dimethyl-A
54	2,5-DMNNA	U		2,5,N,N-Tetramethyl-A
54	?	U		4-Fluoro-2,5,N,N-tetramethyl-A
55	3,4-DMA	A	>160	3,4-Dimethoxy-A
55	2,6-DNNA	U		2,6-Dimethoxy-N,N-dimethyl-A
55	3,5-DNNA	U		3,5-Dimethoxy-N,N-dimethyl-A
56	DMCPA	A	15-20	2-(2,5-Dimethoxy-4-methylphenyl)-cyclopropylamine
56	TMT	S	13	Trans-2-(3,4,5-trimethoxyphenyl)cyclopropylamine
57	DME	S	115	3,4-Dimethoxy-beta-hydroxy-PEA
57	BOHH	S	100	3,4-Methylenedioxy-beta-hydroxy-PEA
58	DMMDA	A	30-75	2,5-Dimethoxy-3,4-methylenedioxy-A

58	?	T	80	threo-2-Amino-3-(2,5-dimethoxy-3,4-MDP)butane
58	?	S	10	erythro-2-Amino-3-(2,5-dimethoxy-3,4-MDP)butane
59	DMMDA-2	A	50	2,3-Dimethoxy-4,5-methylenedioxy-A
60	DMPEA	N	1000	3,4-Dimethoxy-PEA
60	?	N	500	N-Acetyl-3,4-dimethoxy-PEA
61	DOAM	T	10	4-Amyl-2,5-dimethoxy-A
62	DOB	A	1-3	4-Bromo-2,5-dimethoxy-A
63	DOBU	T	2.8	4-Butyl-2,5-dimethoxy-A
63	DOIB	A	10-15	2,5-Dimethoxy-4-(2-methylpropyl)-A
63	DOSB	A	25-30	2,5-Dimethoxy-4-(1,1-dimethylethyl)-A
63	DOTB	S	25	2,5-Dimethoxy-4-(1-methylpropyl)-A
64	DOC	A	1.5-3	4-Chloro-2,5-dimethoxy-A
64	DOA	U		2,5-dimethoxy-4-amino-A
64	DOAA	U		2,5-dimethoxy-4-acetamido-A
65	DOEF	A	2-3.5	4-(2-Fluoroethyl)-2,5-dimethoxy-A
66	DOET	A	2-6	4-Ethyl-2,5-dimethoxy-A
67	DOI	A	1.5-3	4-Iodo-2,5-dimethoxy-A
67	?	S	4	1-(2,5-dimethoxy-4-iodophenyl)-2-aminobutane
68	DOM	A	3-10	4-Methyl-2,5-dimethoxy-A
68	5-DOM	S	20	2,4-Dimethoxy-5-methyl-A
68	2-DOM	U		4,5-Dimethoxy-2-methyl-A
69	pseudo-DOM	A	15-25	4-Methyl-2,6-dimethoxy-A
69	Z-7.1	?		2,4-Dimethoxy-6-methyl-A
69	Z-7.2	U		4-Methyl-2,3,6-trimethoxy-A
70	DON	A	3-4.5	4-Nitro-2,5-dimethoxy-A
71	DOPR	A	2.5-5	4-Propyl-2,5-dimethoxy-A
71	hydroxy-DOPR	S	0.2	2,5-Dimethoxy-4-(1-hydroxypropyl)-A
71	DOIP	T	20-30	2,5-Dimethoxy-4-(i)-propyl-A
72	E	A	40-60	4-Ethoxy-3,5-dimethoxy-PEA
73	EEE	U		2,4,5-Triethoxy-A
74	EEM	U		2,4-Diethoxy-5-methoxy-A
75	EME	U		2,5-Diethoxy-4-methoxy-A
76	EMM	S	50	2-Ethoxy-4,5-dimethoxy-A
77	ETHYL-J	T	90	N,alpha-diethyl-3,4-methylenedioxy-PEA
78	ETHYL-K	S	40	N-Ethyl-alpha-propyl-3,4-methylenedioxy-PEA
79	F-2	S	15	Benzofuran-2-methyl-5-methoxy-6-(2-aminopropane)
79	F	S	30	Benzofuran-2,3-dihydro-5-methoxy-6-(2-aminopropane)
80	F-22	S	15	Benzofuran-2,2-dimethyl-5-methoxy-6-(2-aminopropane)
81	FLEA	A	100-160	N-Hydroxy-N-methyl-3,4-methylene-A
82	G-3	A	12-18	3,4-Trimethylene-2,5-dimethoxy-A
83	G-4	I		3,4-Tetramethylene-2,5-dimethoxy-A
84	G-5	A	14-20	3,4-Norbornyl-2,5-dimethoxy-A
85	GANESHA	A	20-32	3,4-Dimethyl-2,5-dimethoxy-A
86	G-N	S	2	1,4-Dimethoxynaphthyl-2-isopropylamine
87	HOT-2	A	10-18	2,5-Dimethoxy-N-hydroxy-4-ethylthio-PEA

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 88 HOT-7          A  15-25  2,5-Dimethoxy-N-hydroxy-4-(n)-propylthio-PEA
 89 HOT-17         A 70-120  2,5-Dimethoxy-N-hydroxy-4-(s)-butylthio-PEA
 90 IDNNA          S   2.6   2,5-Dimethoxy-N,N-dimethyl-4-iodo-A
 90 ?              U         2,5-Dimethoxy-N-benzyl-4-iodo-A
 90 ?              U         2,5-Dimethoxy-N-benzyl-4-iodo-N-methyl-A
 90 ?              U         2,5-Dimethoxy-N-cyanomethyl-4-iodo-A
 90 ?              U         2,5-Dimethoxy-N-cyclopropylmethyl-4-iodo-A
 90 ?              U         2,5-Dimethoxy-N,N-diethyl-A
 90 ?              U         2,5-Dimethoxy-N,N-diethyl-4-iodo-A
 90 ?              U         2,5-Dimethoxy-N-(3-dimethylaminopropyl)-4-iodo-A
 90 ?              U         2,5-Dimethoxy-N,N-dimethyl-4-iodo-A
 90 ?              U         2,5-Dimethoxy-N-dodecyl-4-iodo-A
 90 ?              U         2,5-Dimethoxy-N-(n)-hexyl-4-iodo-A
 90 ?              U         2,5-Dimethoxy-4-iodo-N-methyl-A
 90 ?              U         2,5-Dimethoxy-4-iodo-N-methyl-N-(i)-propyl-A
 90 ?              U         2,5-Dimethoxy-4-iodo-N-(i)-propyl-A
 91 IM             N   400   2,3,4-Trimethoxy-PEA
 92 IP             A  40-80  3,5-Dimethoxy-4-isopropoxy-PEA
 93 IRIS           S    9    5-Ethoxy-2-methoxy-4-methyl-A
 94 J              A 150-230 alpha-Ethyl-3,4-methylenedioxy-PEA
 95 LOPHOPHINE     S   250   3-Methoxy-4,5-methylenedioxy-PEA
 96 M              A 200-400 3,4,5-Trimethoxy-PEA
 96 ?              N 300-750 N-Acetyl-3,4,5-trimethoxy-PEA
 96 ?              S   25    N-Methyl-3,4,5-trimethoxy-PEA
 96 ?              N   500   N,N-Dimethyl-3,4,5-trimethoxy-PEA
 96 TMPEA          N   750   3,4,5-Trimethoxyphenylacetic acid
 96 ?              N 10-300  2-(3,4,5-Trimethoxyphenoxy)ethylamine
 96 ?              N 10-400  N,N-Dimethyl-2-(3,4,5-trimethoxyphenoxy)ethylamine
 97 4-MA           P  50-80  4-Methoxy-A
 97 2-MA           U         2-Methoxy-A
 97 3-MA           S   50    3-Methoxy-A
 97 Orthoxine      O   200   N-Methyl-2-methoxy-A
 98 MADAM-6        N   280   2,N-Dimethyl-4,5-methylenedioxy-A
 99 MAL            A  40-65  3,5-Dimethoxy-4-methallyloxy-PEA
100 MDA            A 80-160  3,4-Methylenedioxy-A 100 ALPHA         A 10-140  1-Amino-
100 GAMMA          T   200   1-Amino-3-(3,4-methylenedioxyphenyl)propane 100 EDA
50    2,3-Methylenedioxy-A 101 MDAL          S   180   N-Allyl-3,4-methylenedioxy-A 1
103 MDIB           U         3,4-Methylenedioxy-N-(i)-butyl-A 103 MDTB          U
3,4-Methylenedioxy-N-(n)-hexyl-A 103 MDOC          U         3,4-Methylenedioxy-N-(n)
3,4-Methylenedioxy-N-cyanomethyl-A 103 MDBA          U         3,4-Methylenedioxy-N-(
N,N-Dimethyl-3,4-methylenedioxy-A 106 MDE           A 100-200 N-Ethyl-3,4-methylenedi
N-(2-Hydroxyethyl)-3,4-methylenedioxy-A 108 MDIP          T   250   N-Isopropyl-3,4-m
N-Methyl-3,4-ethylenedioxy-A 111 MDMEO         S   180   N-Methoxy-3,4-methylenedioxy
alpha,alpha,N-Trimethyl-3,4-methylenedioxy-PEA 114 MDOH          A 100-160 N-Hydroxy-
N-Methyl-3,4-methylenedixoy-PEA 116 MDPH          A 160-240 alpha,alpha-Dimethyl-3,4-
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N-Propyl-3,4-methylenedioxy-A 119 ME A 200-350 3,4-Dimethoxy-5-ethoxy-PEA
3-Methoxy-4,5-trimethylenedioxy-A 121 MEE S 4.6 2-Methoxy-4,5-diethoxy-
META-DOB T 50-100 5-Bromo-2,4-dimethoxy-A 124 ORTHO-DOB U 2-Bromo-4
N-Methyl-2,5-dimethoxy-A 126 METHYL-TMA T 240 N-Methyl-3,4,5-trimethoxy-A 126
METHYL-DOB P 8 4-Bromo-2,5-dimethoxy-N-methyl-A 128 METHYL-J A 180-210
N-Methyl-alpha-propyl-3,4-methylenedioxy-PEA 129 K U 2-Amino-1-(3
METHYL-L U 2-Methylamino-1-(3,4-methylenedioxyphenyl)hexane 129 ETHYL-L
130 4-MNNA ? 4-Methoxy-N,N-dimethyl-A 130 2-MNNA ? 2-Me
2,5-Dimethoxy-N-methyl-3,4-methylenedioxy-A 132 MMDA A 100-250 3-Methoxy-4,5
2-Methoxy-4,5-methylenedioxy-PEA 133 4C-2 U 1-(2-Methoxy-4,5-methyle
2-Methoxy-3,4-methylenedioxy-A 135 MMDA-3b T 60-80 4-Methoxy-2,3-methylenedio
3,4-Dimethoxy-5-propoxy-PEA 138 MPM T 30 2,5-Dimethoxy-4-propoxy-A 138
138 MAM S 12 4-(n)-Amyl-2,5-dimethoxy-A 139 ORTHO-DOT S 25 2-
3,5-Dimethoxy-4-phenethyloxy-PEA 142 PEA N 1600 PEA 142 MPEA N
4-Propynyloxy-3,5-dimethoxy-PEA 144 SB N 240 3,5-Diethoxy-4-methoxy-PE
4-Ethoxy-3-ethylthio-5-methoxy-PEA 147 4-TASB P 60-100 3-Ethoxy-4-ethylthio-5
4-Thiobutoxy-3,5-dimethoxy-PEA 150 3-TE A 60-80 4-Ethoxy-5-methoxy-3-methy
2-Methylthio-3,4-dimethoxy-PEA 153 3-TIM N 240 3-Methylthio-2,4-dimethoxy
3-Methylthio-4,5-dimethoxy-PEA 156 4-TM A 20-40 4-Methylthio-3,5-dimethoxy
S 100 2,3,4-Trimethoxy-A 160 TMA-4 A 80 2,3,5-Trimethoxy-A 161 TMA-5
2,4,6-Trimethoxy-A 162 2C-TMA-6 U 2,4,6-Trimethoxy-PEA 163 3-TME
N 200 3-Ethoxy-4-methoxy-5-methylthio-PEA 166 2T-MMDA-3a S 12 2-Methylthi
2,4,5-Trimethoxy-PEA 169 2-TOET T 65 4-Ethyl-5-methoxy-2-methylthio-A 170
4-Ethyl-2-methoxy-5-methylthio-PEA 171 2-TOM A 60-100 5-Methoxy-4-methyl-2-m
2-Methoxy-4-methyl-5-methylthio-A 172 2C-5-TOM U 2-Methoxy-4-methyl-5-me
4-Propylthio-3,5-dimethoxy-PEA 175 TRIS N 240 3,4,5-Triethoxy-PEA 176 3-
178 3-T-TRIS S 160 4,5-Diethoxy-3-ethylthio-PEA 179 4-T-TRIS N 200