

Qualia Computing

Revealing the computational properties of consciousness

CONSCIOUSNESS RESEARCH, EXPERIMENT, PSYCHEDELIC, PSYCHEDELIC CRYPTOGRAPHY, PSYCHOPHYSICS, SEX

Algorithmic Reduction of Psychedelic States

⌚ June 20 by [algekalipso](#)

Only when sexual choice favored the reportability of our subjective experiences- with the emergence of the mental clearing-house we call consciousness- did our strangely promiscuous introspection abilities emerge, such that we seem to have instant conscious access to such a range of impressions, ideas, and feelings. This may explain why philosophical writing about consciousness so often sounds like love poetry- philosophers of mind, like lovesick teenagers, dwell upon the redness of the rose, the emotional urgency of music, the soft warmth of skin, and the existential loneliness of the self. The philosophers wonder why such subjective experiences exist, given that they seem irrelevant to our survival prospects, while the lovesick teenagers know perfectly well that their romantic success depends, in part, on making a credible show of aesthetic sensitivity to their own conscious pleasures.

– *The Mating Mind: How Sexual Choice Shaped the Evolution of Human Nature* (pg. 365) by Geoffrey F. Miller

A Darwinian Set and Setting

According to *The Mating Mind*, human sexual selection favors particular fitness-indicating traits, both physical and mental. In the context of mental traits, we have verbal and introspective abilities, agreeableness, conscientiousness, openness to experience, low neuroticism and extroversion. No matter how verbally capable and introspective a given person is, unless that is balanced with some degree of agreeableness, conscientiousness, etc. the person will not be all *that* attractive. But, when all else is being held equal, stronger verbal and introspective abilities are favored. Teenagers, arguably, know this best of all: courtship is intensely verbal.

Our minds evolved in a Darwinian environment. If people like Miller are right in thinking that language evolved as a fitness indicator, we are right to expect that the way we think and verbalize is biased to be impressive to the members of the opposite sex during courtship. Powerful introspective abilities, as it were, can make one's language seem deeper, more romantic, and even at an entirely different level than that of one's peers. In this backdrop of sexual choices and judgements, it is not surprising that humans would develop ever-increasing verbal and introspective capacities. At some point everyday life could not present sufficient

opportunities for people, especially males, to show off their own abilities. And as these abilities increased over time, culture was forced to invent *handicaps* so that people could display their top capabilities. Over time, elaborate and competitive handicaps were integrated into the culture. Even verbal and introspective abilities at the top of the scale can still be compared side by side by using carefully selected handicaps: for example, poetry is exactly that; rhyme, rhythm and meter make it easier for the best poets to show off their excellent abilities. The handicaps adjust to the maximum level of competence in the population.

The space of handicaps that are used to show off traits that are reliable indicators of fitness is very large. From Greek Symposiums to modern day Frat Parties, Western civilization has embraced a niche subculture that uses chemical handicaps as a means to display verbal, social and creative skills. If you can philosophize after drinking a gallon of wine, or stay capable of *managing the playlist* after 16 cheap cans of beer, you are showing off your biological robustness. Clearly, many of our ancestors were capable of impressing potential sexual mates with a mixture of booze, loud music and stunning philosophical conversations.

One could argue that psychedelics have come to disrupt our traditional games of handicaps. “Sure you can drink a bottle of tequila and sing in a band, but can you take three hits of acid and tell me what your experience reveals about the intrinsic nature of consciousness?” Psychedelics are, in a way, a cultural hyper-stimulus that presents the most difficult and interesting handicap currently in existence for verbal and introspective abilities.

Cultures can have an allergic reaction to the states of consciousness that these agents can disclose; people are afraid that psychedelic users will discover something that they themselves don’t know. Notably, psychedelicists (<http://slatestarcodex.com/2016/04/28/why-were-early-psychadelicists-so-weird/>) have been both demonized and deified since the 60s. Sure, these researchers became extremely open minded, and in many ways weird. But, above all, they became *extremely interesting people*. And interesting people who challenge the current games of status can cause cultural allergic reactions.

Every *acid head* and psychedelic researcher has a pet theory of what these compounds are *really doing* in one’s mind. Many of these folk theories about the effects of psychedelics involve ontologies that currently have little scientific support (such as souls, thought fields, spirit worlds (https://www.goodreads.com/author/quotes/158496.Alexander_Shulgin), archetypes (<http://www.lsdexperience.com/part-2/mythology-myth/>), alien conspiracies (<http://ketamine.co.uk/john-lilly.html>), and so on). Although we cannot rule out explanations of this sort out of hand, the ontologies themselves are so abstract and poorly defined that we cannot accept them as useful forms of reductions. That said, their future versions will be more interesting. It is likely that committed, rational, spiritual psychedelic users will formalize models of this sort at some point. Rather than talking about a “spirit world,” they will talk about “mind-independent extra-dimensional space that consciousness can access in altered states” and then go on to define the differential equations that govern consciousness’s interactions with this space. When this happens, we will be in a much better position to assess the validity of these models, test the reality of those spaces, and perhaps even recruit the extra-dimensional inhabitants of these worlds for computational tasks (<http://slatestarcodex.com/2015/04/21/universal-love-said-the-cactus-person/>).

Psychedelic experiences drastically increase people’s introspection, capacity for deep aesthetic appreciation, while at the same time increasing their ability to entertain unusual ideas. Insofar as the selection pressures of our introspective abilities have been heavily biased towards courtship ability, it is not surprising that people tend to immediately cast self-enhancing, life-affirming and magical narratives into their interpretations of their personal psychedelic experiences. After all, having a very interesting story to tell is highly praised during courtship. Are people’s psychedelic narratives a modern day form of the peacock’s tail? While psychedelic talk does not yet form part of any mainstream game of courtship, I envision this changing in the next decades. Undoubtedly, the most insightful, sound, and scientifically rigorous members of the Super-Shulgin Academy (<https://qualiacomputing.com/2016/02/04/the-super-shulgin-academy-a-singularity-i-can-believe-in/>) will attract attention, status, resources and... desirable mates.

What is the deep structure of psychedelic experiences?

Psychedelics seem to have a generalized effect on one's consciousness. At minimum, we could talk of experience amplification. Without delving into specifics, psychedelics introduce spontaneous activity into our consciousness that our mind is compelled to integrate somehow. Our state of consciousness changes dynamically as our mind adjusts itself to the incoming stimulation. The result is tightly dependent on the interplay between our brain anatomy, motivational system and the actual changes to the micro-structure of consciousness induced by LSD.

As John Lilly noted in light of his psychedelic experiences: “in the province of the mind, what one believes to be true is true or becomes true, within certain limits to be found experientially and experimentally. These limits are further beliefs to be transcended. In the mind, there are no limits...”.* While there are reasons not to take this literally, we have grounds for claiming that a large number of limits on our experience are placed there by our deeply held beliefs and attitudes. The space of possible LSD experiences that a single individual can experience is much larger than what said individual will typically be able to explore in practice. Many limits are imposed by his or her beliefs and background assumptions, rather than by physiology per se. Social cognition is a profound attractor in psychedelic experiences. “What will I say about this? What would this person think about this experience? etc.” are captivating thoughts. However, they occupy valuable mental space. And the thick mental judgements that people naturally focus on come with large conceptual and emotional baggage that taints the experience. Meditators, philosophers and scientists are more likely to set aside some time during their explorations to delve more deeply into what the energy introduced by LSD can produce in one’s consciousness.

After extreme training and tens (or hundreds) of trips, dedicated psychonauts will discover qualities that all of the trips share. Most people will likely experience a variant of Lilly’s realization that whatever you believe can *be perceived as true* during psychedelic experiences. Lilly emphasized the limitless quality of the mind, but one must wonder: If one *can experience as true* anything *conceivable*, are we not, then, limited by what we can conceive? No matter how much time one spends with an open mind waiting for new and interesting ideas to take shape, one cannot know the nature of *what one has not yet even conceived of*.

It may be true that we will always find fundamental limits that cannot be overcome. There are fundamental physiological constraints to the possible configurations of our consciousness, and arguably, chemical agents, while capable of expanding the space of possibilities, will not automatically give access to all possible states of consciousness. As future research is likely to show, 2C-B and LSD probably facilitate slightly different kinds of thoughts and experiences. Thus the limits of our mind are at least to a large extent the result of our physiology. Memes and meditation can only go so far.

In addition to physiological limits, the structure of the state-space of qualia (<https://qualiacomputing.com/2015/03/08/phenomenal-puzzles-cielab/>) is itself a constraint on what can and cannot be experienced. To the extent that psychedelic states enable the exploration of a larger space of possible experiences, we are more likely while on psychedelics to find states of consciousness that demonstrate fundamental limits imposed by the structure of the state-space of qualia. In normal everyday experience we can see that yellow and blue cannot be mixed (phenomenologically), while yellow and red can (and thus deliver orange). This being a constraint of the state-space of qualia itself is not at all evident, but it is a good candidate and many introspective individuals agree. On psychedelic states one can detect many other rules like that, except that they operate on much higher-dimensional and synesthetic spaces (E.g. “Some feelings of roughness and tinges of triangle orange can mix well, while some spiky mongrels and blue halos simply won’t touch no matter how much I try.” – 150 micrograms of LSD).

One of the objectives of Qualia Computing is to define the state space of possible experiences and the interdependencies between them. While normal everyday states of consciousness are important datapoints, I predict that the bulk of the most useful information will come from studying the behavior and mechanics of consciousness in radically altered states. To this end, however, we should focus on simple explanations that can be generalized to all psychedelic experiences.

Starting Background Assumptions

For the purpose of this article I will assume that direct realism, in all of its guises, is wrong. That is, I will assume that any mind-independent object can only be experienced indirectly. What we experience is not the object (or beings) themselves, but a qualia-furnished representation entirely contained within one's mind (this is often called the *simulationist* account of perception). Furthermore, I will also assume that the behavior of the universe can be fully described with the Standard Model of physics (or a future version of it).

In what follows I will propose, as a first approximation, an *algorithmic reduction* of psychedelic states; I will propose a set of changes in our consciousness that (1) is as simple and assumption-free as possible, and (2) can be used to reconstruct as many psychedelic effects as possible.

Two Kinds of Reduction

The word reduction in the context of philosophy of science has a lot of historical and conceptual baggage (<http://plato.stanford.edu/entries/scientific-reduction/>). In the context of this article, I will use the word in the following sense: We say that a property of a given phenomenon X reduces to Y if we can fully explain X's property by referencing Y's properties. X can be a physical phenomenon, a mathematical construct or even an experience. Y is an ontology with interaction rules, which allow the pieces of said ontology to interact with one another. We do not commit to the idea that Y itself needs to be the fundamental (or true) ontology of X. But we do want to make sure that Y is at least more fundamental than X in some appropriate sense. So what kind of ontologies can Y have? In the context of philosophy of mind, reductions usually attempt to account for not only the behavior of consciousness but also for its underlying nature. Thus, functionalism is both a reduction program as well as a philosophical take on what the mind fundamentally is.

Thankfully, we do not need to commit to any ontology in order to advance a particular style of reduction. Reductions are useful regardless: they reduce the amount of information needed to describe a phenomenon, and if accurate, they can also make useful predictions. Finally, these reductions can provide hints for how to bridge different areas of science; by identifying isomorphisms or even further reductions, entire fields can cross-pollinate once their respective reductions are compatible (such as biology and chemistry or chemistry and physics).

Atomistic Reduction

For most intents and purposes, science relies on a particular kind of reduction that we can call *atomistic reduction*. This style of reduction focuses on explaining macroscopic phenomena by modeling it as the emergent structure of many particles interacting with one another at a much finer level of resolution. Even though this style of reduction is usually fruitful (e.g. thermodynamics), it can be counter-productive to assume in some situations. An extreme case would be the quantum computer. If states of superposition help a computer find an answer, it will be hard to explain the behavior of said superposition by postulating that it actually reduces to little particles interacting using simple rules. The model could in principle be worked out, but at the cost of very high complexity. It would be much easier to start with a quantum-mechanical ontology that allows the superposition of wavefunctions! Then what is left is to reduce the rest of the computer to quantum mechanics (which is possible, given that particle models and quantum mechanical models usually converge at the macroscopic limit).

It is tempting to try to reduce the properties of the mind (including psychedelic states) using an *atomistic reduction*. Unfortunately, the phenomenal binding problem (<https://qualiacomputing.com/2015/04/19/why-not-computing-qualia/>) adds a complication to this reduction. Rather than discussing (right now) whether an atomistic (and thus classical) account will ultimately be capable of modeling conscious experience, we will side-step this problem by using a different style of reduction. We will focus only on the algorithmic level of analysis.

Algorithmic Reduction

Without assuming a fundamental ontology (atoms, fields, wavefunctions, etc.) we can still make a lot of progress. We can restrict ourselves to identifying what we call an algorithmic reduction: find a set of procedures, state-spaces, shapes and overall main effects out of which you can reconstruct as much of the observed behavior as possible.

In reality, every reduction is, at least in part, an algorithmic reduction. By specifying a particular ontology such as “particles”, we restrict the shape of our possible reductions. By keeping the reduction at the algorithmic level, we allow arbitrary ontologies to be the final explanations (then depending on actual empirical measurements). The main criteria for success still includes (1) the overall complexity of the model, and (2) the explanatory power of the model. In other words, how easily and precisely does the model reconstruct the behavior of our experiences?

A Zoo of Psychedelic Effects

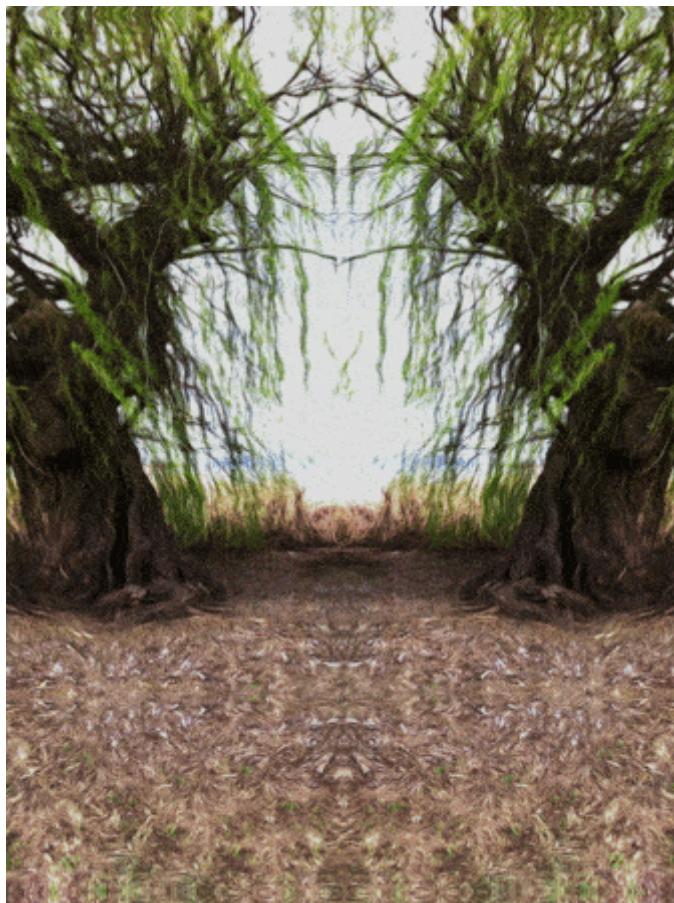
PsychonautWiki (https://psychonautwiki.org/wiki/Main_Page) has a detailed and fascinating taxonomy of reported psychedelic visual effects (https://psychonautwiki.org/wiki/Visual_effects - Psychedelics). One could argue that all of these countless effects are completely unique. As a philosopher might put it, these effects may ultimately be *qualitatively irreducible* to one another. But what are the chances that a simple molecule would happen to trigger a whole zoo of unrelated effects? As a form of reduction, nothing is achieved by stating that every effect is its own unique phenomenon.

Four Principal Operators: A Simple Algorithmic Model of Psychedelic States

In trying to account for the strange effects of psychedelics, we will aim to propose as few *main effects* as possible and then use these effects, and their interactions, to *derive* all of the remaining effects. By doing this, we will be algorithmically reducing the complex phenomena found in psychedelic states. In turn, this will allow us to increase our understanding of the source of information processing benefits (<http://druglibrary.org/schaffer/lsd/harman.htm>) provided by psychedelic states, and to derive new and exciting applications of such states (<https://qualiacomputing.com/2015/05/22/how-to-secretly-communicate-with-people-on-lsd/>). Additionally, by identifying a good algorithmic reduction, we might be able to refine the states themselves, to amplify their benefits while minimizing the drawbacks.

The model we will treat for now has four main effects, and with those four effects we will attempt to reconstruct the rest. These effects are:

1. control interruption (<https://psychonautwiki.org/wiki/Tracers>)
2. drifting (<https://psychonautwiki.org/wiki/Drifting>)
3. eidetic (<http://psychedelic-information-theory.com/eidetic-hallucination>)hallucinations/enhanced pattern recognition (https://psychonautwiki.org/wiki/Pattern_recognition_enhancement)/apophenia (<https://en.wikipedia.org/wiki/Apophenia>)
4. symmetry detection (https://psychonautwiki.org/wiki/Symmetrical_texture_repetition)/symmetry propagation



Symmetric drifting. What would Giulio Tononi think about this? [Source](https://psychonautwiki.org/wiki/File:Symmetric_pattern_drifting.gif) (https://psychonautwiki.org/wiki/File:Symmetric_pattern_drifting.gif).

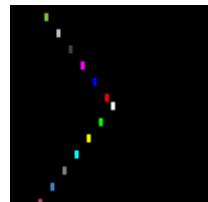
Control interruption is the simplest and most universal psychedelic effect. It enables the buildup of qualia in one's consciousness. People say that psychedelics are *intense, deep, bright*, etc. Every experience, whether a thought, a smell or an emotion, seems to be both stronger and longer-lasting on psychedelics.

Things seem more lively, and this is not because a switch is suddenly turned on and your experience of the current input is amplified. Rather, one seems to be experiencing a gentle overlap of many previous frames (and feature bundles) of one's experience. In medium to high doses, this can give rise to solid [frame stacking](https://qualiacomputing.com/2015/05/22/how-to-secretly-communicate-with-people-on-lsd/) (<https://qualiacomputing.com/2015/05/22/how-to-secretly-communicate-with-people-on-lsd/>). In turn, the buildup of sensation creates complex patterns of interference:

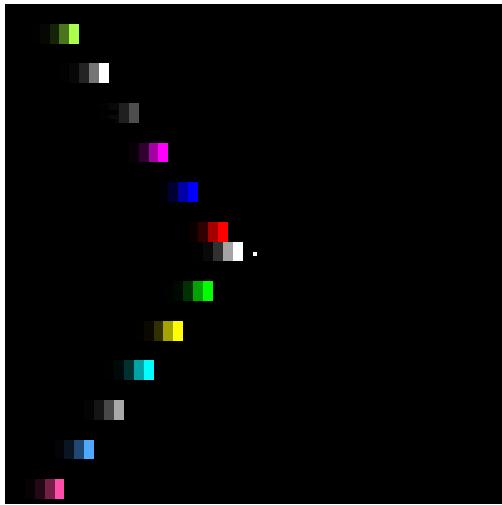
In order for a perceptual system to transition from a linear to a nonlinear state, negative feedback control must be subverted. If control is entirely removed then perception becomes totally unconstrained, leaving a system that is quickly overloaded with too much information. If control is placed in a state where it is partially removed or in a toggled superposition where it is alternately in control and not in control over the period of a rapid oscillation, then the constraints of linear sensory throughput will bifurcate into a nonlinear spectrum of multi-stable output with signal complexity correlating to the functional interruption of control. Common entheogenic wisdom states that you must relinquish control and submit to the experience to get the most out of psychedelics. Holding onto control causes negative experiences and amplifies anxiety; letting go of control and embracing unconstrained perception is a central psychedelic tenet. This demonstrates that psychedelics directly subvert feedback control over linear perception to promote states of unconstrained consciousness.

– Control Interrupt Model of Psychedelic Action, [PIT](http://psychedelic-information-theory.com/The-Control-Interrupt-Model-of-Psychedelic-Action) (<http://psychedelic-information-theory.com/The-Control-Interrupt-Model-of-Psychedelic-Action>)

Control interruption explains a large variety of effects, including the increase in the raw intensity (and amount) of experience, as well as the longer lasting positive afterimages (and thus tracers). Here we show a simple example of this effect. Consider the “original stimuli” to be what one experiences under a sober state. Likewise, consider the 9 squares to be different states of consciousness brought up by various psychotropic combinations.

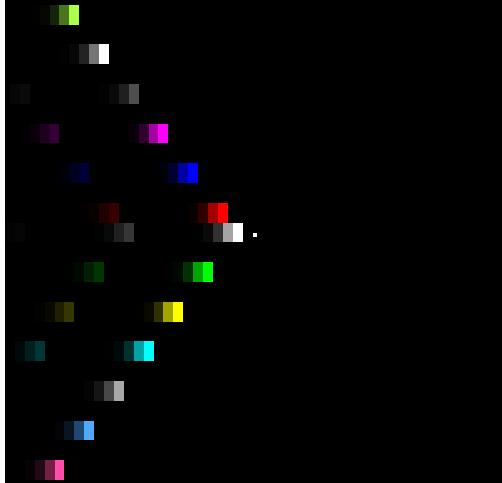


Original



(https://qualiacomputing.com/2016/06/20/algorithmic-reduction-of-psychedelic-states/oscillation_1_5_5_75_3_0_10_0-05_signal_trailing/)

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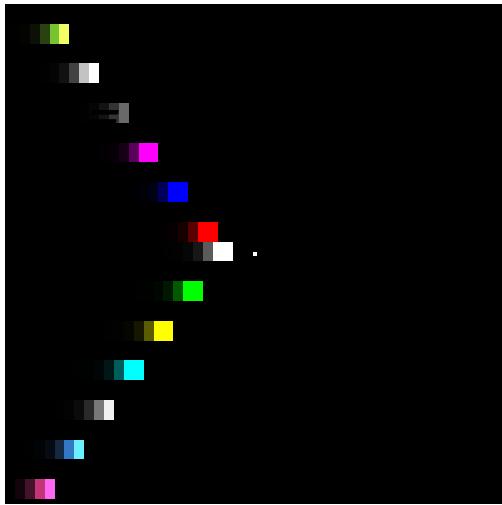
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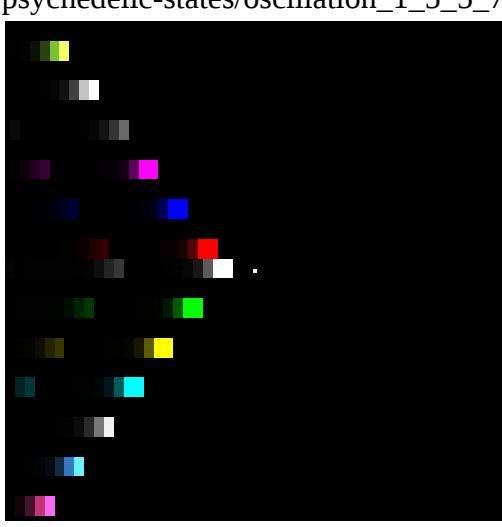


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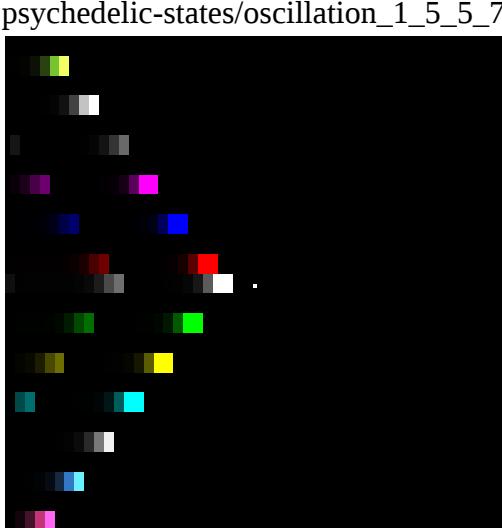
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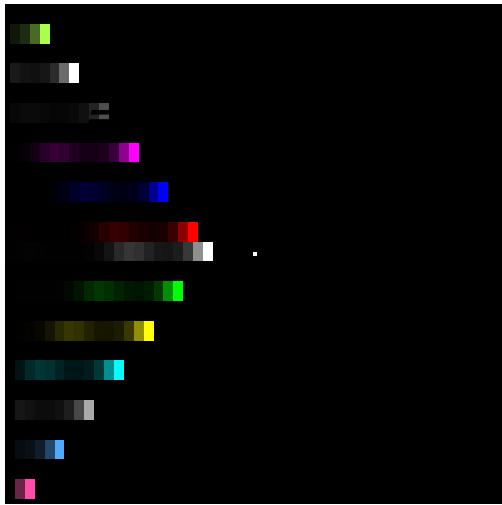
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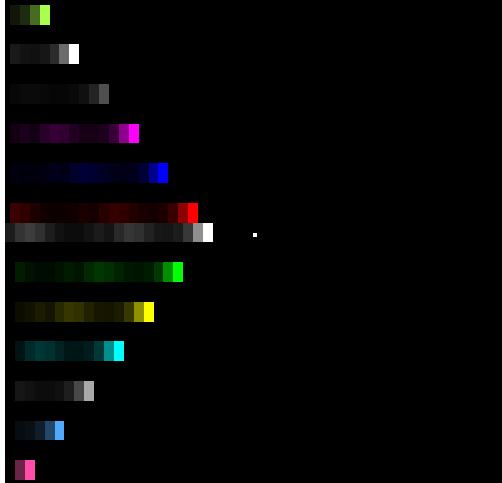


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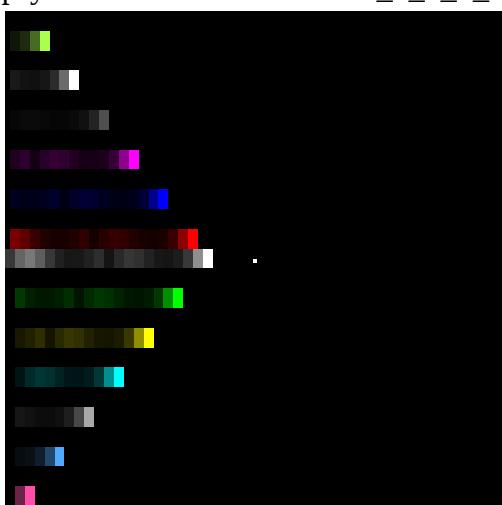
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The 9 gifs you see above are simulations of control interruption using a simple feedback model (which we will describe in detail in a later article). The x-axis has different “echo strengths” while the y-axis has varying feedback strengths. These are two of the model parameters. Notice that the lower right corner is a credible rendition of something that people describe as *moments of eternity*. These are experiences where time seems to stop due to an over-saturation of regular and ordered qualia.

When considering the following effects, don’t forget that control interruption is also going on all the time. The stranger the psychedelic effect, the more intense it is.

Drifting is responsible for *breathing walls, animated plants, feelings of boundary dissolution, merging and melting*, and so on. Small amounts of drifting usually involve individual feature detachments from perceptual objects (such as the color and shape of a chair becoming dissociated). Medium amounts of drifting make textures flow constantly. If one's experience was made of tiny magnetic gears that are usually aligned in a coherent way, drifting would result from increasing the overall energy of the system. Thus, the visual system is constantly descending to "more aligned local states" while incoming energy is constantly adding noise and destroying all of the alignment progress made.



Source: PsychonautWiki, [Anonymous](#)
(https://psychonautwiki.org/wiki/File:White_Wolf_Drinking_Water_by_Anonymous.gif)

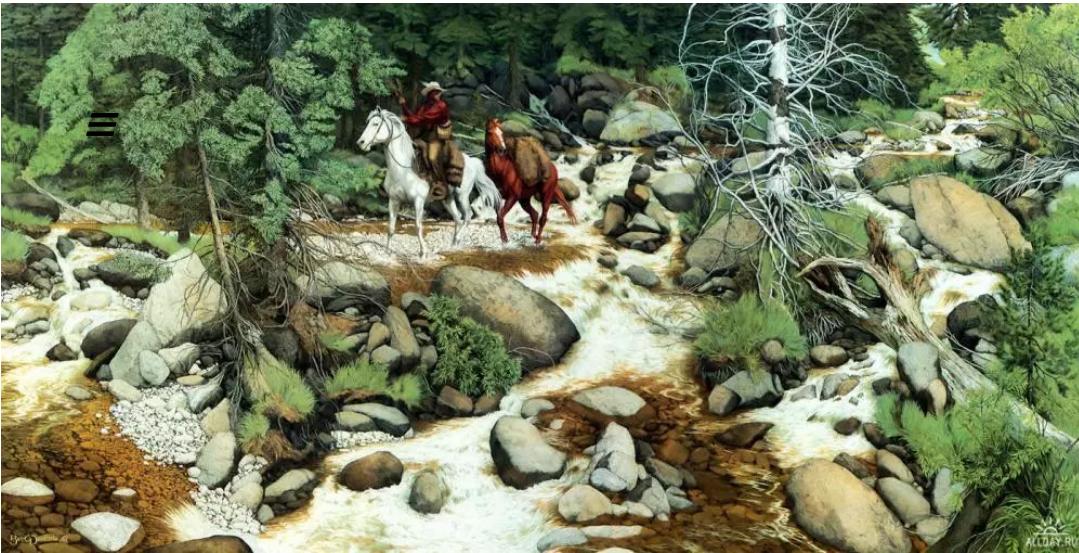
A particularly salient aspect of drifting is that features and locally-bound fragments of experience can drift in any direction in 3D. Pieces of the wall don't only drift left and right, but also forwards and backwards.

On high doses of psychedelics or synergistic combinations of dissociatives and psychedelics (e.g. LSD + nitrous, 2C-B + ketamine, etc.), drifting can become all-encompassing. A critical point is crossed when one loses the capacity to define a *mainframe of experience* (the dominating orientation-giving island of locally bound experience that we use as a reference point). When this happens, one feels like one cannot tell left from right, or up from down. One simply experiences a constant chaotic flow of experience. In some cases one can even spot interesting instabilities that resemble actual physical instabilities found in fluid mechanics (such as the [Kelvin–Helmholtz instability](https://en.wikipedia.org/wiki/Kelvin-Helmholtz_instability) (https://en.wikipedia.org/wiki/Kelvin%E2%80%93Helmholtz_instability)).

Drifting does not occur in isolation, and its mechanics are dependent on the particular set and setting in which the psychedelic experience is developing. From a computational point of view, drifting can be useful because it allows a quick exploration of the state-space of possible local binding configurations between the phenomenal objects present in one's experience. Indeed, not only does red fail to mix with green, but many of the synesthetic qualia varieties present in a scene with constant drifting will refuse to touch each other. Drifting feels like there is some sort of psychedelic energy (somewhat reminiscent of anxiety, but not restricted to body feelings) that overheats certain parts of one's conscious experience, and in turn disassembles the local connections there.

Enhanced Pattern Recognition: This effect refers to the transient (but often powerful) lowering of the detection threshold for previously experienced patterns and known ontologies (e.g. animals, plants, people, etc.). Psychedelics, in other words, temporarily increase one's degree of [apophenia](#) (<https://en.wikipedia.org/wiki/Apophenia>). Another name given to this effect is [eidetic hallucinations](#) (<http://psychedelic-information-theory.com/eidetic-hallucination>). From a Bayesian point of view, the effect could be described thus: psychedelics intensify the effect of our priors. As explained in [Getting Closer to Digital LSD](#) (<https://qualiacomputing.com/2015/06/19/getting-closer-to-digital-lsd/>), Google's deep belief neural network inceptionist technique works by finding bundles of features that trigger high-level neurons (such as face-detectors, object-detectors, etc) at sub-threshold levels (e.g. "this almost looks like a frog") and then modifying the picture so that the network more strongly detects those same high level features. This particular algorithm can be understood in terms of the pharmacological action of psychedelics: one can have breakthroughs of eidetic hallucinations by impairing the inhibitory control coming from the cortex.

In a sense we could say that while tracers are the result of "simple cell control interruption", eidetic hallucinations are the result of "complex cell control interruption." The former allows the build-up of colors, edges and simple shapes, while the latter amplifies the features that trigger high-level percepts such as faces and objects.



Enhanced Pattern Recognition / Eidetic Hallucinations / Visual Apophenia

The way one directs attention during a psychedelic trip influences the way eidetic hallucinations evolve over time. For this reason any psychedelic replication movie will probably require human input (in the form of eye-tracking) in order to incorporate human saliency preferences and interests into an evolving virtual psychedelic trip simulated with the [Inceptionist Method](https://research.googleblog.com/2015/06/inceptionism-going-deeper-into-neural.html) (<https://research.googleblog.com/2015/06/inceptionism-going-deeper-into-neural.html>).

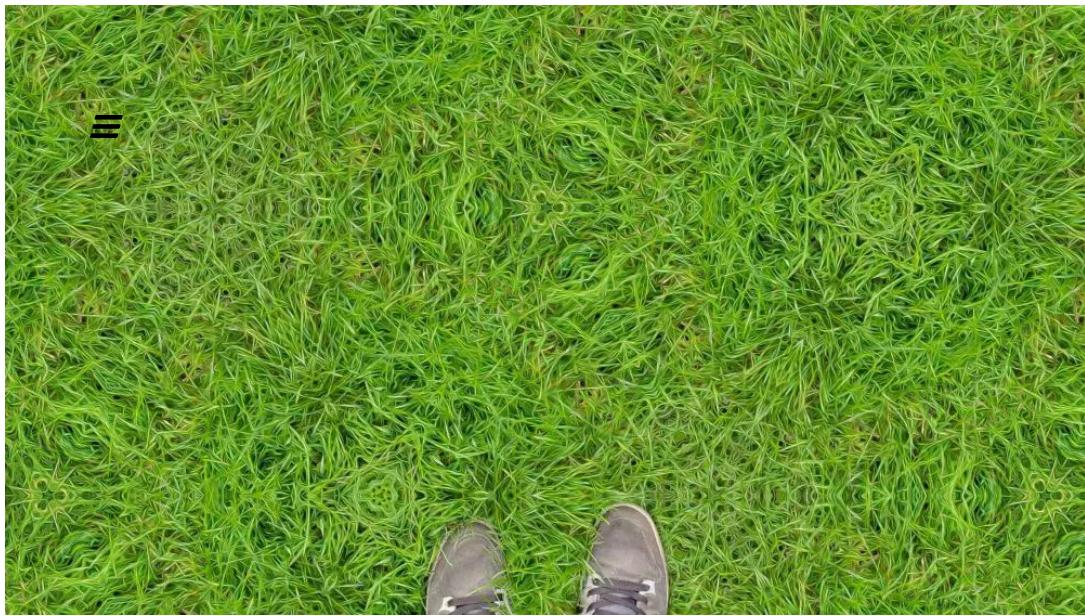
Lower Symmetry Detection and Propagation Thresholds: Finally, this is perhaps the most interesting and scientifically salient effect of psychedelics. The first three effects are not particularly difficult to square with standard neuroscience. This fourth effect, while not incompatible with connectionist accounts, does suggest a series of research questions that may hint at an entirely new paradigm for understanding consciousness.

I have not seen anyone in the literature specifically identify this effect in all of its generality. The lowering of the symmetry detection threshold really has to be experienced to be believed. I claim that this effect manifests in all psychedelic experiences to a greater or lesser extent, and that many effects can in fact be explained by simply applying this effect iteratively.

Psychedelics make it easier to find similarities between any two given phenomenal objects. When applied to perception, this effect can be described as a lowering of the symmetry detection threshold. This effect is extremely general and symmetry should not be taken to exclusively refer to geometric symmetry.

How symmetries manifest depends on the set and setting. Researchers interested in verifying and exploring the quantitative and subjective properties of this effect will probably have to focus first on a narrow domain; the effect happens in all experiential modalities.

For now, let us focus on the case of visual experience. In this domain, the effect is what PsychonautWiki [calls](#) (https://psychonautwiki.org/wiki/Visual_effects - Psychedelics#Symmetrical_texture_repetition) Symmetrical Texture Repetition:



Credit: Chelsea Morgan from [PsychonautWiki](#) (https://psychonautwiki.org/wiki/Symmetrical_texture_repetition) and r/replications

Symmetry detection can be (and typically is) recursively applied to previously detected *symmetry bundles*. A given symmetry bundle is a set of n-dimensional symmetry planes (lines, hyperplanes, etc.) for which the qualities of the experience surrounding this bundle obey the symmetry constraints imposed by these planes. The planes can create mirror, rotational or oblique symmetry. Each symmetry bundle is capable of establishing a *merging relationship* with another symmetry bundle. These relationships are fleeting, but they influence the evolution of the relative position of each plane of symmetry. When x symmetry planes are in a merging relationship, one's mind tries to re-arrange them (often using drifting) to create a symmetrical arrangement of these x symmetry planes. To do so, the mind detects one (or several) more symmetry planes, along which the previously-existing symmetry planes are made to conform, to organize in a symmetrical way (mirror, rotational, translational or otherwise). There is an irresistible subjective *pull* towards those higher levels of symmetry. The direction of highest symmetry and meta-symmetry feels blissful, interesting, mind-expanding, and awe-producing.

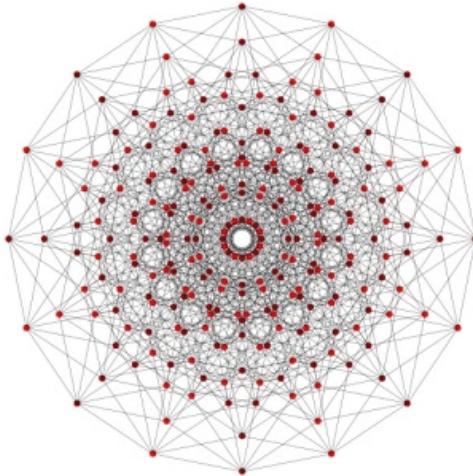
If one meditates in a sensorially-minimized room during a psychedelic experience while being aware that one's symmetry detection threshold has been lowered by the substance, one can recursively re-apply this effect to produce all kinds of complex mathematical structures in one's mind.

In the future, perhaps at a [Super-Shulgin Academy](#) (<https://qualiacomputing.com/2016/03/29/peaceful-qualia-the-manhattan-project-of-consciousness/>), people will explore and compare the various states of consciousness that exhibit peak symmetry. These states would be the result of iteratively applying symmetry detection, amplification and re-arrangement. We would see fractals, tessellations, graphs and higher dimensional projections. Which one of these experiences contains the highest degree of inter-connectivity? And if psychedelic symmetry is somehow related to conscious bliss, which experience of symmetry is *human peak bliss*?

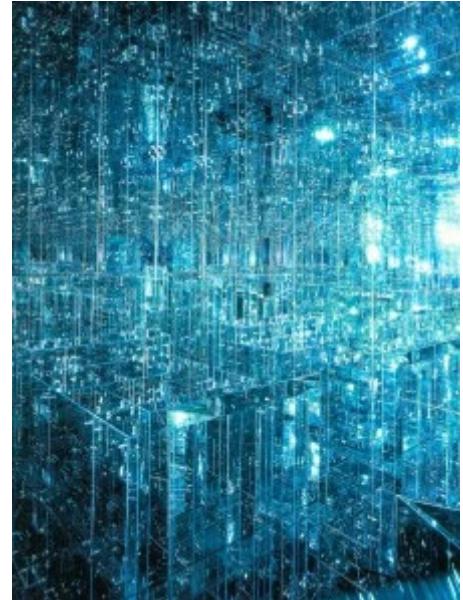


The pictures above all illustrate possible *peak symmetry states* one can achieve by combining psychedelics and meditation. The pictures illustrate only the core structure of symmetries that are present in these states of consciousness. What is being reflected is the very raw "feels" of each patch of your experiential field. Thus these pictures really miss the actual raw feelings of the whole experience. They do show, however, a rough outline of symmetrical relationships possible in one of these experiences.

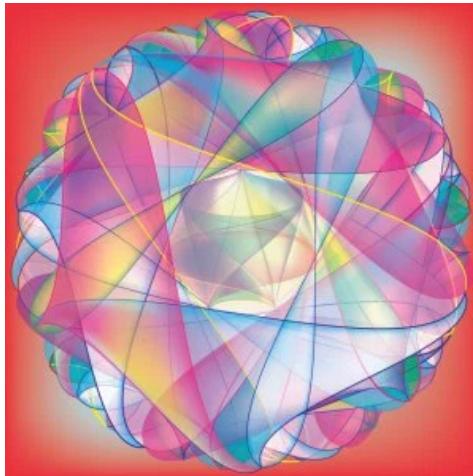
Scale-Free Fractal



Higher Order Symmetry



Mirror Symmetry Tessellation



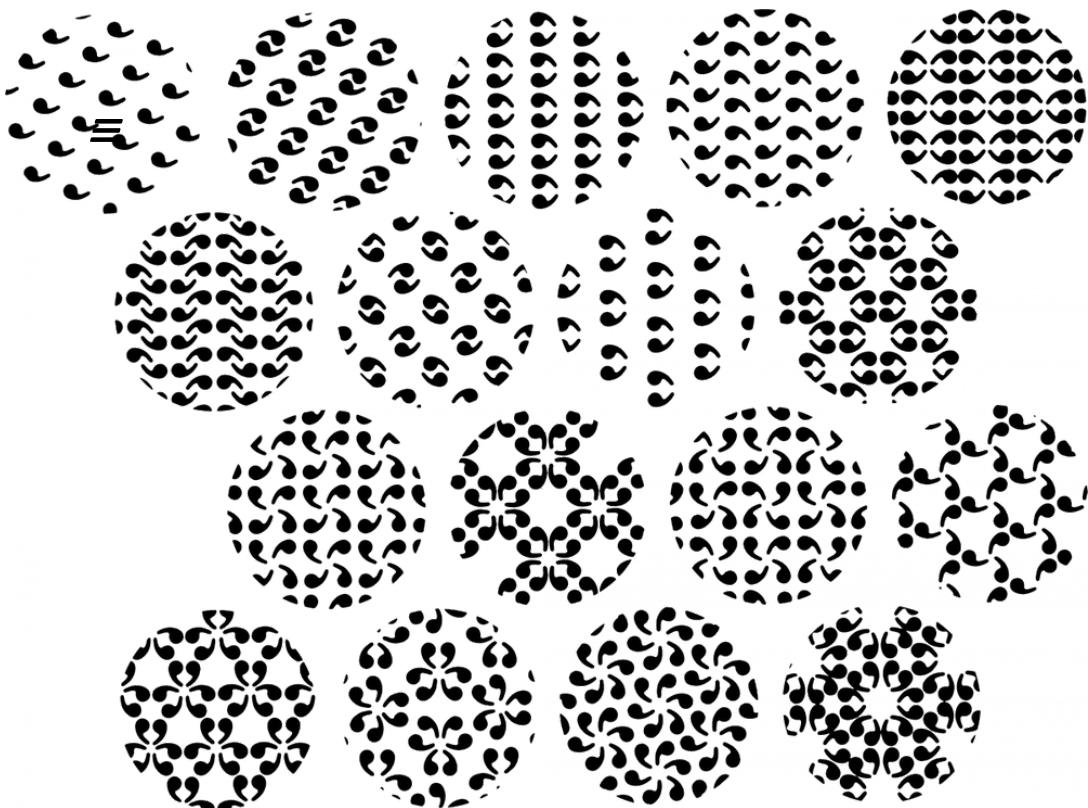
Symmetrical Manifold

Since control interruption is also co-occurrent with the psychedelic symmetry effect, previously-detected symmetries tend to linger for long periods of time. For this reason, the kinds of symmetries one can detect at a given point in time is a function of the symmetries that are currently being highlighted. And thanks to drifting and pattern recognition enhancement, there is some wiggle room for your mind to re-arrange the location of the symmetries experienced. The four effects together enable, at times, a smooth iterative integration of so many symmetries that one's consciousness becomes symmetrically interconnected to an unbelievable degree.

What may innocently start as a simple two-sided mirror symmetry can end up producing complex arrangements of self-reflecting mirrors showing glimpses of higher and higher dimensional symmetries. Studying the mathematical properties of the allowed symmetries is a research project that has only just begun. I hope one day dedicated mathematicians describe in full the class of possible high-order symmetries that humans can experience in these states.

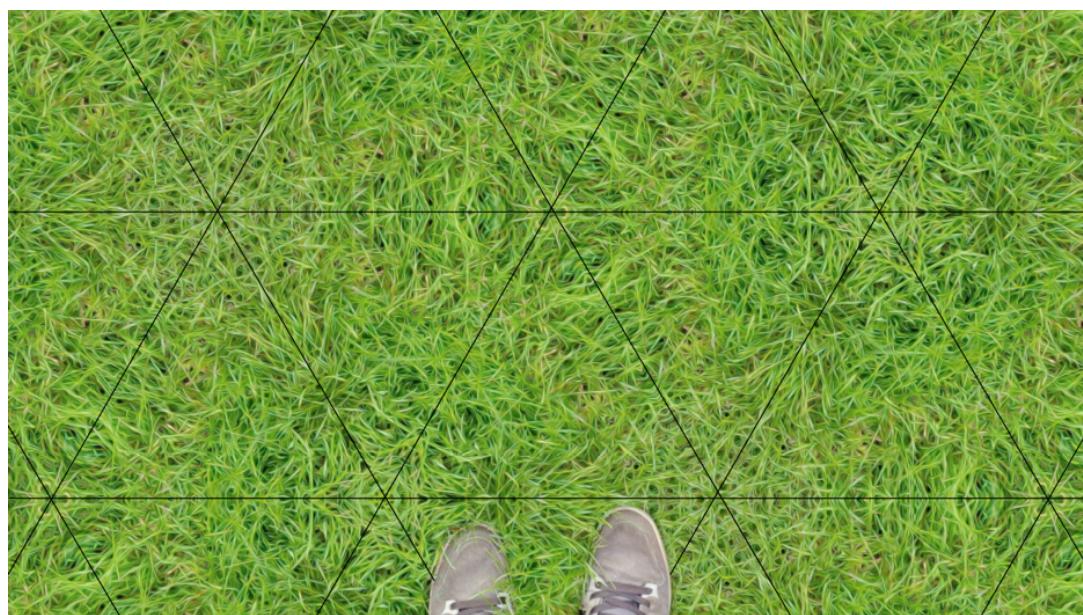
Anecdotally, each of the [17 possible wallpaper symmetry groups](#)

(https://en.wikipedia.org/wiki/Wallpaper_group) can be instantiated with this effect. In other words, psychedelic states lower the symmetry detection threshold for all of the mathematically available symmetrical tessellations.



All of the 17 2-dimensional wallpaper groups can be experienced with symmetry planes detected, amplified and re-arranged during a psychedelic experience.

Revising the symmetrical texture repetition of grass shown above, we can now discover that the picture displays the wallpaper symmetry found in the lower left circle above:



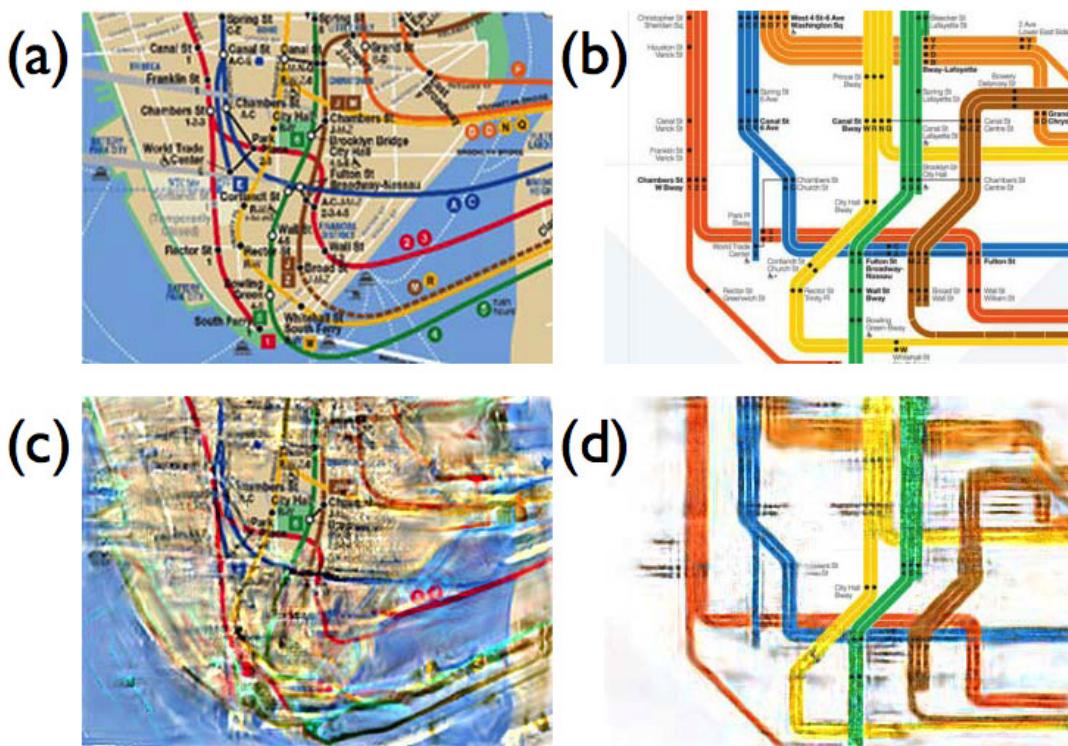
In very high doses, the symmetry completion is so strong that at any point one risks confusing left and right, and thus losing grasp of one's orientation in space and time. Depersonalization is, at times, the result of the information that is lost when there is intense symmetry completion going on. One's self-models become symmetrical too quickly, and one finds it hard to articulate a grounded point of view.

The Micro-Structure of Consciousness

At Qualia Computing (<https://qualiacomputing.com/about/>) we explore models of consciousness that acknowledge the micro-structure of consciousness. Experiences are not just higher-order mental operations applied to propositional content (<http://plato.stanford.edu/entries/consciousness-higher/>). Rather, an instant of experience contains numerous low-level textural properties. This is true for every sensory modality, and I would argue, even for the what-its-likeness of thought itself. Even just thinking about a mathematical idea (ex. “the intersection of two arbitrary sets”) is done by interacting with a background of raw feels, and these raw feels determine our attitudes and interactions with the ideas we are trying to abstract (some people, for example, experience emotional distress when trying out mathematical problems, and this is not because certain mathematical spaces are inherently unpleasant or anxiety-inducing).

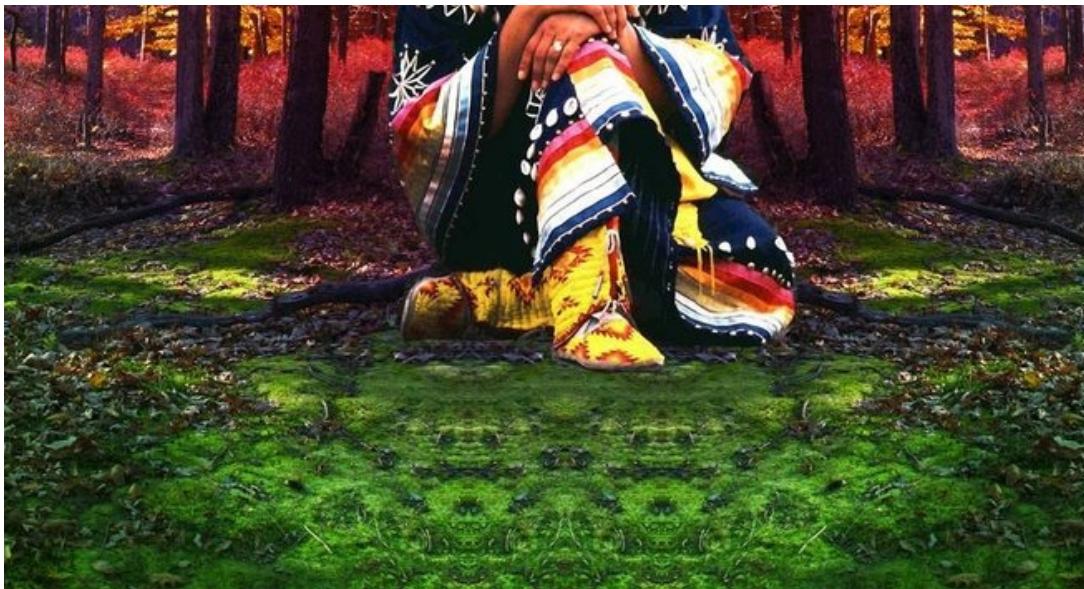
In the case of vision, the micro-structure of consciousness is capable of supporting at least the following low-level features: color, color gradients, points, edges, oriented movement, and acceleration. A full conversation about the range of visual features that we are capable of experiencing is a discussion for another time. But for the time being, it will suffice to point out that (static) models of peripheral vision only need 5 summary statistics (<https://qualiacomputing.com/2015/04/20/psychophysics-for-psychadelic-research-textures/>). With only five summary stats you can create textures that a human will find impossible to distinguish in peripheral vision.

These so-called *mongrels* (<http://persci.mit.edu/mongrels/applications.html>) are textural (<http://jov.arvojournals.org/article.aspx?articleid=2122150>) metamers (<http://www.nature.com/neuro/journal/v14/n9/full/nn.2889.html>) (equivalence classes of subjectively indistinguishable input patterns ([https://en.wikipedia.org/wiki/Metamerism_\(color\)](https://en.wikipedia.org/wiki/Metamerism_(color)))). The state-space of perceptible visual textures is the space of possible mongrels, and that is an example of the sort of micro-structure we are looking for. Unlike the cozy high-definition space inscribed in the fovea, most of the information found in our sensory modalities comes in the form of textures that are mappable to state-spaces of summary statistics.



Psychedelic symmetry detection and amplification operates on the inner structure of mongrels. The fact that the mongrels are the objects becoming symmetric is something that can elude introspection until someone points it out. It happens right in front of any tripper’s eyes and yet people don’t seem to report it very often (if at all). This may be a result of the fact that the fine-grained structure of consciousness is rarely a topic of conversation,

and that we usually describe what we see in the fovea (unless we have no other option). Our words usually refer to whole percepts or, at best, the simplest raw values of experience (such as the hue of colors or the presence of edges). And yet, the structure of our mongrels is quite obvious once symmetry propagation has conformed a large patch of your experience to have a tessellated identical mongrel repeating across it.



How Are these Components Related to Each Other?

The [Kaleidoscopic technique to induce qualia annealing](https://qualiacomputing.com/2016/03/29/peaceful-quale-the-manhattan-project-of-consciousness/) (<https://qualiacomputing.com/2016/03/29/peaceful-quale-the-manhattan-project-of-consciousness/>) relies on a combination of drifting and symmetry detection in order to resolve implicit inconsistencies within one's own memory gestalts. As we live and grow our experienced evidence base, we accumulate memories and impressions of many worldviews. Each worldview is, in a way, a response to all of the previous ones (or at least the memorable ones) and the current situation and the problems one is facing. Thanks to the four effects here described, a person can utilize a psychedelic state to increase the probability of the systematic co-occurrence of (usually) mutually-exclusive gestalts (worldviews) and thus enable their mutual awareness. And with mutual awareness, the symmetry detection and amplification effect creates (somehow forcefully) a unified phenomenal object that incorporates the inconsistent views into an unbiased (or less biased) point of view. One can achieve a higher order of memetic and affective integration.



Mongrel repetition / symmetrical tessellation. Source.

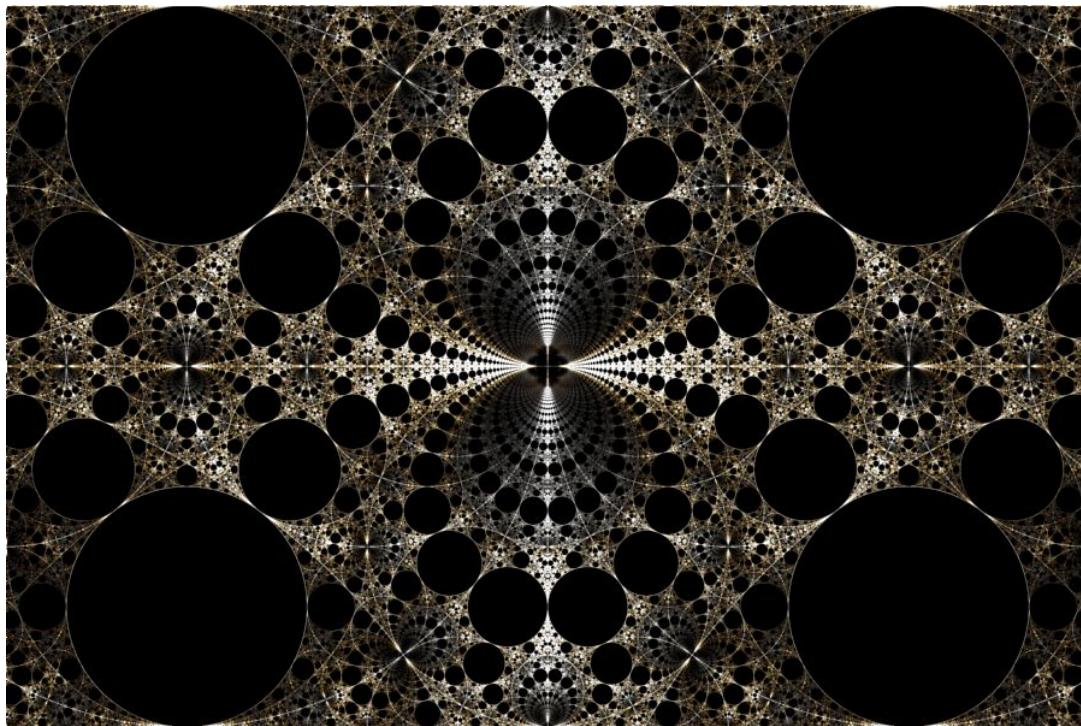
(https://www.reddit.com/r/replications/comments/4o16w9/took_these_back_in_october_2015_and_just_realize_d/)

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Psychedelics as Introspectoscopes**

Given the symmetry detection and amplification property of psychedelics, one can reasonably argue that psychedelic states may be able to reveal the properties of the micro-structure of consciousness. Timothy Leary, among others, described LSD as a sort of microscope for one's psyche. The very word *psychedelic* means mind-manifest (the manifestation of one's mind). Given the four components of these experiences, the fact that psychedelics work as some sort of microscope should not be surprising. Symmetry detection and control interruption multiply the amount of raw experience, while pattern recognition shows you what you are expecting (your priors become evident) and drifting makes the fleeting synesthetic effects malleable and easier to move around. People generally agree that psychedelics can show you subtle aspects of your own mind with stark clarity. But can they reveal the intrinsic properties of the nature of qualia at the most fundamental level?

The way to achieve this may be to create a fractal structure of symmetries in such a way that any tiny part of one's experience can get reflected throughout the entirety of the phenomenal structure. One can then use eidetic hallucinations (or further symmetry detection) to focus and stabilize the fractal structure. Thus one would multiply the surface area of all of one's attention into countless replicas of the micro-structure of a given part of one's experience. A fractal kaleidoscopic mirror amplifier chamber is exactly what I imagine when I think about how to analyze the fine-grained structure of consciousness. And it so happens that meditation plus psychedelics can allow you to (fleetingly) build just that.



Psychedelic Introspectoscope (fractal kaleidoscope of generalized symmetries) to amplify arbitrary qualia values (such as particular emotions, phenomenal colors, synesthetic inter-junctions, etc.)

Any subtle qualia space can be multiplied countless times in such a way that all of one's experience becomes a coherent interlocking structure that can be perceived all at once. If one wants to study, for example, the possible interactions between two hues of color, one can amplify the boundary between two regions that make the

desired contrast of hues and make the entire fractal structure amplify this boundary hundreds of times.

Arguably, if one discovers that certain qualia values cannot be mixed in the introspectoscope (such as blue and yellow), one may still not know if these are fundamental constraints, or if they are the result of our [connectome](http://www.humanconnectomeproject.org/) (<http://www.humanconnectomeproject.org/>) structure. If, on the other hand, two qualia values can mix in the introspectoscope, then we would know that they are not fundamentally mutually exclusive. Thus we would find out relational properties of the very state-space of qualia.

Reducing All Effects

Can we derive all psychedelic effects using the four components discussed above? While this is not yet possible, I trust that further work will show how most of the weird (and weirder) effects of psychedelics may be reduced to relatively simple (but not always atomistic) algorithms applied to the micro-structure of consciousness. I anticipate that we will discover that high doses actually produce entirely new effects (for example, what happens on 400 micrograms of LSD often include qualitative jumps from what happens at 150 micrograms). To note, [ontological qualia](https://qualiacomputing.com/2015/12/17/ontological-qualia-the-future-of-personal-identity/) (<https://qualiacomputing.com/2015/12/17/ontological-qualia-the-future-of-personal-identity/>) and other subtle aspects of consciousness may resist reduction for still many more decades to come.

*[Programming and Meta programming in the Human Biocomputer](https://qualiacomputing.com/2016/06/02/psychedelic-alignment-cascades/)
(<https://qualiacomputing.com/2016/06/02/psychedelic-alignment-cascades/>)

**An Introspectoscope is a hypothetical apparatus that enables a person to study the deep structure of his or her own consciousness. The concept comes from a paper in the making by [Andrew Y. Lee](http://philosophy.fas.nyu.edu/object/philo.people.andrewlee) (<http://philosophy.fas.nyu.edu/object/philo.people.andrewlee>). Obviously this comes with significant challenges. Some challenges come from the fact that we are trying to analyze something very small, and other challenges come from the fact we are trying to analyze qualia. Additionally, there are unique challenges that come from analyzing microscopic qualia qua microscopic qualia. I suggest that we use methods that amplify the micro-structure by taking advantage of fractal states: recursive and scale-free symmetry planes can amplify anything minute to a prominent place in the entire consciousness. Be careful not to amplify pain!

[consciousness](#) [drugs](#) [manifold](#) [patterns](#) [phenomenal binding](#) [phenomenal puzzle](#) [qualia](#)
[Simoncelli](#)

8 comments

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functor · June 21

Have you investigated the psychedelic and dissociative properties of dextromorphan (aka DXM/cough syrup)? It has a couple of effects that I do not think fit into your list. I've tried dozens of psychedelic and dissociative substances and these effects, in my experience, are totally unique to DXM.

The first one, which I think is somehow related to its antitussive properties, is some type of increased level of control over the nervous system. For example, if I have been recently injured, I am able to modulate the degree to which I experience pain in the injured area. I can crank it up really high and feel extremely uncomfortable, or set it to zero and not notice it at all (which is more the default state, since it's a dissociative). Another example: if I get a shiver down my spine, I am able to "catch it", and then expand the feeling throughout my entire body (this is very pleasurable). I am also able to control the ability to get/lose an erection without any sexual stimuli. This is just a short list of examples of these types of effects, but I think they all belong to the same category. All of these new "abilities" are intuitive as well, though I did not notice that I had them until I had taken DXM several times.

The second one is an effect that has been described as the "holodeck" or "waking lucid dream". Essentially, you can close your eyes and imagine anything, and a remarkably vivid and clear visual representation of it will appear in your mind's eye. I find the effect very similar to lucid dreaming. I think most dissociatives give closed-eye visuals, but DXM has been the only one for me where I seem to have almost complete control over them. Again, this control is completely intuitive. Sometimes the closed eye visuals are fed directly to you, though, and cannot be interrupted.

Another interesting dissociative effect that I've only experienced on ketamine that doesn't quite seem to fit into these categories are abstract symbols and diagrams appearing in the field of vision. I'm a mathematician, and when I am coming out of the K-hole and start to think of math, strings of equations and mathematical-looking diagrams will suddenly start filling my field of vision. I don't have to be thinking deeply of anything in particular (and it would be very difficult to in this state), but for example if I start thinking of geometry then I'll see portions of geometric equations, glimpses of various manifolds, commutative diagrams, etc. Coming out of a K-hole is the only time this has ever happened to me on any substance, but I've never seen this effect described anywhere (possibly due to a lack of mathematicians with a large amount of experience with psychoactive substances posting about it online). Unfortunately I haven't done this enough times to confirm how much substance these diagrams actually have, or if they are complete nonsense.

Reply

John · June 21

Which math courses did you take in college? And which do you think is most important to have if you want to do this kind of research?

Best regards,

John

Reply

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Glen Etzkorn · June 21

can not folks make use of internal supply of DMT? The ancient ones in the Americas did.and found the nature of color beneath itself. Modern fools assert it was all in the plant material, but actually the ancient ones knew it was only a party material for a very few of the perceptual levels. Think Ramondi Stella – Two orientations , the second orientation excludes the powerful harsh plant material.

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Reply

Sebastian · June 21

Regarding your point on lowered symmetry detection and propagation thresholds on psychedelics, I was reminded of a lecture I read in a collection of gregory bateson's work, "Steps toward an Ecology of mind", where he talks about the connection between symmetry and information, using developmental abnormalities in beetles(limb duplications) as an example. I'm packing at the moment, so I can't spend time remembering all the details, but the gist was that asymmetries contain more information than symmetries, and for an axis of difference to form requires some 'impulse' or impetus for it's development (another example being the anterior-posterior axis around which the developing embryo orients itself being defined by the point of impact of fertilisation by the spermatozoa).

It seems to me that the lowered threshold for finding symmetries in the perceptual field may be an extension of the pattern recognition amplification effect (or maybe the symmetry detection thing is more basic?). I've been mulling over the connection between the extraction of meaningful information from the or a perceptual field (or just a field or group of 'meaningless' information more generally) and the reduction of complexities into simplicities through generalisation and simplification and analogy, and the experience of meaning more generally. I feel like there's a connection there but I don't have the background in maths or physics to understand enough about information theory to make any progress, just vague pestering intuitions.

If you think this line of thought is worth pursuing please let me know.

Reply

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