

Visual Patterns of Hallucination as a Basis for Sonic Arts Composition

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ABSTRACT

Visual patterns of hallucination; pin-point dot patterns of light, arranged in spiral or funnel structures are often perceived in hallucinogenic experiences such as those produced by mescaline. This article discusses the use of altered states of consciousness (ASC) and visual patterns of hallucination, as principles upon which to base the design of musical compositions and related audio-visual works. I provide some background information regarding visual patterns of hallucination (or ‘entoptic phenomena’), with reference to studies by Klüver and Strassman. I then proceed to discuss a process for using visual patterns of hallucination as a basis for designing sonic and visual material, using a purpose-built piece of software: the *Atomizer Live Patch*. The implementation of this sonic material in the context of ‘ASC compositions’ is discussed with regards to *Entoptic Phenomena*, a fixed electroacoustic composition, and *Tiny Jungle*, an audio-visual work. These pieces form part of a larger body of work completed as part of my PhD research, where ASC was used as a principle for the design of electroacoustic music and work in related mediums. Through the discussion of these works I will demonstrate an approach for using ASC, and visual patterns of hallucination in particular, as a basis for the design of sonic artworks and visual music. This research therefore contributes to the field of compositional methods for electroacoustic music, while more broadly indicating approaches for creating digital artworks that reflect ASC.

Categories and Subject Descriptors

H.5.5 [Information Interfaces and Presentation]: Sound and Music Computing – *methodologies and techniques*.

General Terms

Performance, Design, Experimentation.

Keywords

Sonic Arts, Electroacoustic Music, Compositional Techniques, Altered States of Consciousness, Visual Music, Max/MSP, Laptop Performance.

1. INTRODUCTION

Throughout history many different cultures have used plants and drugs to alter human consciousness [1]. ‘Altered states of AM ’13, September 18 - 20 2013, Piteå, Sweden

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consciousness’ (ASC) encompasses a broad range of states, including dream, delirium, hallucination, meditation, sleep paralysis and trance. Of particular interest to my research are those hallucinations that can be temporarily induced through the use of psychedelic plants and drugs, such as mescaline and DMT (Dimethyltryptamine). Hobson describes these states as comparable to dreams, resulting from changes to the functioning of the brain [2]. These changes may affect perception in various ways, including an increased production of internally produced visual patterns of hallucination (entoptic phenomena).

How can ASC be translated into works of art? The method that I have explored in my compositions is to use ASC as a principle for constructing mimetic sonic material¹. To explain this approach, I shall first use a visual arts analogy. If one were to produce a watercolour painting of a room, the scene might typically be painted with a substantial degree of accuracy; the artist may attempt to lay out the geometry and perspective in a proportional and reasonably realistic manner. Contrast this with a scene that is painted so that it resembles what may be seen in a mescaline experience. To achieve this the artist may adapt their approach in accordance with the form of the experience: perspective may be deliberately warped and the colour contrast increased. Perhaps the artist will add strange entities, or pattern effects, such as one might perceive during the experience. In the example, the typical approaches of watercolour are used as normal; water and paint are mixed together using a brush, and brush strokes are applied to the canvas. However, the design of the composition has been adapted to describe an ASC experience.

A similar approach can be taken with sound. My compositional approach is situated within the electroacoustic idiom; I am using familiar techniques of computer music. However the manner in which these are applied can be adapted in accordance with ASC experiences, by creating mimetic sonic material. To provide an example: hallucinogenic experiences may result in distortions to time perception, where a single moment in time seems to last much longer than usual. This can be analogously described in sound by time-stretching sonic material, tangibly extending the duration of the sound. Or perhaps we might take a voice and manipulate its motion within the spatial field in such a way as to reflect a sense of perceptual distortion and illusion, just as one might experience during an ASC. In this way ASC can be used as a principle for the creation of analogous sonic materials. ASC can also be used to inform the structure of a piece. Hallucinogenic experiences typically have an onset, plateau and termination².

¹ Use of the term ‘mimetic’ here refers to Emerson’s definition [3].

² Erowid [4] provides a database of user-written experience reports for a wide range of substances. Many of these reports

This can be used as a basis for the design of corresponding musical sections. Using such techniques, digital audio may provide a means for creating non-realistic, otherworldly sonic environments that are based upon hallucinogenic experiences.

The reception of these works is open to audience interpretation; DeNora cautions us against ascribing any specific effects to the compositional design of music, since this varies depending upon the listener and context in which a work is heard [5]. Nonetheless, she describes a process through which music can ‘afford’ certain responses. Musical meaning says DeNora, is acquired through a two-way process between musical object and listener, and becomes reinforced through patterns of listening. As Kendall discusses, electroacoustic music affords the listener the possibility of perceiving non-realistic or illusory sonic environments and journeys [6]. Considered in these terms, ASC can be used as a principle for the design of these illusory sonic environments. Appropriate design of the piece may then afford a possible interpretation of the music by listeners as a hallucinatory narrative that is experienced through sound.

This outlines the general approach that I have taken with my compositions. This process relies upon the composer’s ability to translate typical features of a hallucinatory experience into the design of corresponding materials. My research devises a variety of methods to accomplish this, translating various typical features of ASC into corresponding techniques. Visual patterns of hallucination are one such feature that commonly occurs in hallucinatory ASC. The processes used for creating material that is based upon this particular feature are the focus of this article. Through the following sections I will discuss what is meant by ‘visual patterns of hallucination’ in further detail. I will explain how these can be translated into sonic or visual materials, and discuss a specially designed tool: the *Atomizer Live Patch* [7]. I will also explain how these materials have been incorporated in two works that use ASC as a compositional principle: *Entoptic Phenomena* (a fixed piece of electroacoustic music) and *Tiny Jungle* (an audio-visual work) [8].

2. ENTOPTIC FORM CONSTANTS

Heinrich Klüver’s *Mescal and Mechanisms of Hallucinations* documents a psychological study in which participants were given the hallucinogen mescaline in controlled doses [9]. Klüver’s subjects describe changes in perception and visual phenomena that occur during the experience. Over the course of several hours participants would perceive initial visual effects such as lattice and honeycomb shapes, gradually progressing to more and more intricate hallucinations based on these forms. At the peak of the experience complete dreamlike visions and scenarios may be perceived, before the effects begin to recede [10].

Although the content of these experiences varies dramatically, Klüver identifies ‘form constants’ in his subjects’ experiences:

‘...mescaline intoxication yielded the following form constants: (a) grating, lattice, fretwork, filigree, honeycomb, or chessboard; (b) cobweb; (c) tunnel, funnel, alley, cone or vessel; (d) spiral. Many phenomena are, on close examination, nothing but modifications and transformations of these basic forms.’ [10]

detail the structure of the experience by noting the qualitative experience at different time intervals.

According to Klüver, these form constants are the basis for mescaline visions. Through the course of the experience, interpretive psychological processes produce progressively more intricate and elaborate visions derived from these forms [12]. For example, a cobweb design in the early stages of hallucination may later be perceived as an actual tunnel in the context of a vision. Klüver is inconclusive as to the origin of these forms but proposes that they may occur due to ‘entoptic phenomena’ (meaning “within the eye”³), though a subsequent study suggests the patterns may actually be produced in the visual cortex of the brain [13].

Bressloff et al. discuss the origin of these visual forms through an analysis of mathematical expressions that produce similar patterns. Figure 1 shows several of the images from this study. These funnel and vortex shapes can be created from transformations of grids, lattices and honeycombs. The images are shown here to give a general indication of how these form constants may appear, however note that the interpretive process which Klüver describes means that in practice entoptic patterns would probably be perceived as visions derived from these forms (as opposed to a direct rendering of these forms). For example, one of Klüver’s participants describes:

‘Immediately before my eyes are a vast number of rings, apparently made of extremely fine steel wire, all constantly rotating in the direction of the hands of a clock; these circles are concentrically arranged, the innermost being infinitely small, almost pointlike, the outermost being about a meter and a half in diameter. The spaces between the wires seem brighter than the wires themselves. Now the wires shine like dim silver in parts. Now a beautiful light violet tint has developed in them. As I watch the centre seems to recede into the depth of the room, leaving the periphery stationary, till the whole assumes the form of a deep funnel of wire rings.’ [14]

Note that a correlation between Klüver’s form constants is recognisable in the description, though a great deal of complexity is added such as the manifestation of wire rings and the animation of the vision. This account can be considered as an interpretive vision derived from the form constants. Klüver indicates that the form constants create a basis for hallucinations that are abstracted through the imaginative faculties of the mind.

³ It should be noted that there are other types of ‘entoptic phenomena’ that occur in the eye, such as floaters. For the purposes of my article ‘entoptic phenomena’ refers only to visual patterns of hallucination. The term is used to preserve continuity with other texts such as Klüver’s.

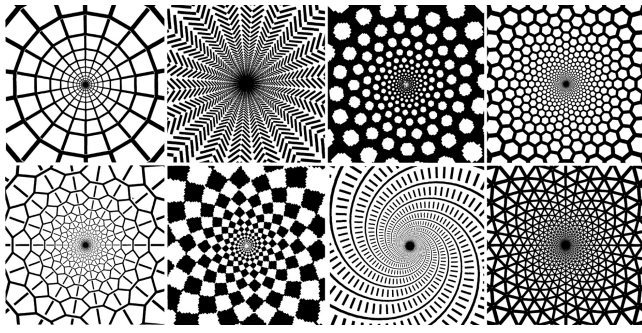


Figure 1. Entoptic form constants, selected images edited from Bressloff *et al.* Copyright © 2001, The Royal Society.

Visions of this kind are also typical of other psychedelic hallucinogens. Rick Strassman’s studies on DMT in the 1990s evidence similar results:

‘Subjects saw all sorts of imaginable and unimaginable things. The least complex were kaleidoscope geometric patterns, which sometimes partook “Mayan”, “Islamic” or “Aztec” qualities. For example, “beautiful colourful pink cobweb; an elongation of light”, tremendously intricate tiny geometric colours, like being one inch from a colour television”... There were “tunnels,” “stairways,” “ducts,” and “a spinning gold disc.” Others saw the “inner workings” of machines or bodies: “inside a computer’s boards,” “DNA double helices,” and “the pulsating diaphragm around my heart.”’ [15]

Note that once again, Klüver’s form constants are present with the description of elongated cobwebs and tunnels, but the descriptions of more elaborate patterns and forms such as Mayan patterns or circuit boards can be speculatively accounted for as perhaps resulting from further layers of interpretative complexity, caused by imaginative faculties of the mind.

Lewis-Williams and Dowson have suggested that Upper Paleolithic rock art may contain shamanic depictions of entoptic phenomena [16]. If this is correct then the act of attempting to represent visual patterns of hallucination through artistic mediums is actually many thousands of years old. Computer music and digital arts may then be considered to provide new possibilities for representing visual patterns of hallucination.

3. DESIGNING CORRESPONDING MATERIAL

The audio-visual composition *Tiny Jungle* represents visual patterns of hallucination by generating a variety of corresponding visual forms. This is achieved through a variety of techniques including hand-drawn material (digitised), 3D animation and video filter effects. This technique creates animated visual material that represents various abstracted forms based on those shown figure 1.

While *Tiny Jungle* uses visual animation to represent visual patterns of hallucination, *Entoptic Phenomena* reflects these patterns through sound. This is less straightforward, since the visual patterns must be translated into suitably corresponding sonic materials. To achieve this I draw upon the approaches of speedcore techno, and in particular those used by Laurent Mialon (aka. La Peste) and those ‘flashcore’ artists published on his

Hangars Liquides record label⁴. This music uses dense arrangements of bass drum sounds at fast tempos, in the context of a form of electronic music that draws upon industrial, techno, cyberpunk and electroacoustic traditions.

I adopted a similar approach to the use of rhythmic sound as a means to analogously describe entoptic phenomena. Streams of rapid rhythmic pulses that move in a circular motion around the auditory spatial field are used to reflect the spirals of dots perceived in hallucinations. Each rhythmic sound is considered to correspond to a point of light in a visual pattern of hallucination. By creating a spiral of these ‘rhythmic points’, it was considered that the material would assume some imitative properties of visual patterns of hallucination. Just as the vortex patterns shown in figure 1 are produced from transformations of grids, transformations of rhythmic grids (quantized rhythmic sounds) create mimetic sounds. The *Atomizer Live Patch* was designed primarily to facilitate the production of these ‘entoptic sounds’, however it was also further developed in order to contextualise them in a composition alongside other sounds in real-time laptop performances. A discussion of the functionality of this software follows.

4. ATOMIZER LIVE PATCH

4.1 Overview

The *Atomizer Live Patch* consists of three types of sound generating processes. The ‘atomizer’ modules produce streams of rhythmic and micro-rhythmic sound, which are used to create the entoptic sounds discussed. A ‘drone machine’ provides a means of creating sonic material which is mimetic of the distortions to time perception perceived in an ASC experience. The additional ‘dj mixer’ enables pre-planned supporting material to be performed continuously in a flexible sequence, contextualising the entoptic and droning sounds within a compositional structure that is based upon the progression of a typical ASC. All modules are designed to allow real-time surround sound spatialisation in 5.1. Developed in Max/MSP (a graphical programming language for sound), the software provides an efficient means of real-time performance that incorporates only the desired functionality.

The *Atomizer Live Patch* was designed to incorporate semi-random triggering and pitch modulation of the ‘entoptic sounds’. These random features were incorporated in order to reflect the qualities of spontaneous variation in the hallucinations that participants describe. In addition to these in-built features that are intended to introduce spontaneous or unpredictable characteristics to the sound, haptic control by a performer was also considered a suitable means to facilitate such elements. The *Atomizer Live Patch* is therefore designed for real-time operation using a Bitstream 3X MIDI controller [18]. This allows the composer/performer to incorporate spontaneous control adjustments into the design of sonic material. Material for fixed compositions such as *Entoptic Phenomena* is therefore created by recording real-time performances with the patch and editing the resultant material. The software is used to create these sounds in real-time for certain laptop performances of the works. In either instance the incorporation of unpredictable or spontaneous characteristics into the design of sounds was considered appropriate and desirable.

⁴ Speedcore techno is a form of hardcore techno music (electronic dance music) with fast tempos, typically around 250 beats per minute. For a further discussion of Hangars Liquides and the forms of electronic dance music I refer to here, see [17].

4.2 Atomizer / Atomizer Joystick/Ribbon

Figure 2 shows the user interface of the *Atomizer Live Patch*. The ‘atomizer’ and ‘atomizer joystick/ribbon’ modules produce rhythmic and micro-rhythmic pulses. The atomizer is a sampler that stores ten short rhythmic sound files. Several banks of these rhythmic sounds are embedded in the patch. When the atomizer is triggered, one of these sound files will be triggered either specifically or at random depending on the trigger note. The trigger for the atomizer can come from a variety of sources. An inbuilt matrix sequencer enables rhythmic patterns to be designed, stored and recalled. The sequencer allows specific or random triggers to be programmed. The button labelled ‘#’ enables instant switching between these patterns at random, while the ‘BPM’ dial enables tactile control over the tempo of the sequenced rhythms. The ‘rand speed’ control module sends a trigger at random intervals with increased regularity as the control value is increased, while simultaneously sending a trigger at regular intervals with increased speed as the control value is increased. The matrix and random/repeating modes of triggering can be used independently or simultaneously to create rhythmic grids of sound which have variable random components of organisation.

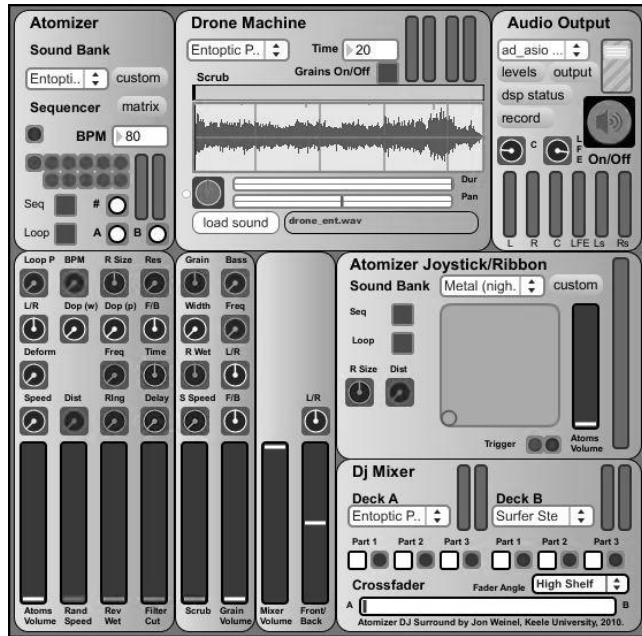


Figure 2. *Atomizer Live Patch*, main user interface.

The triggered sound files can be selected for playback either as ‘one-shots’ or as loops. Volume, speed of playback (changing the pitch) and loop end-point can be adjusted. A ‘deform’ control also enables a semi-random pitch bend effect. This control creates a pitch bend based on the random interpolation of two breakpoint graphs. The deform control then adjusts what ratio of this value affects the pitch. Finally audio effects are provided: distortion, ring modulator, delay, reverb, filter and spatialisation: Doppler, pan left/right and front/back.

There are two instances of the atomizer module in the current version of the *Atomizer Live Patch*. The first, shown on the left hand side of figure 2 is the primary module that has a more comprehensive level of control using the 4 sliders and 15 dials located directly beneath the module itself. The second is the atomizer joystick/ribbon module, which utilises its own separate bank of sounds. This is controlled using the X-Y joystick and ribbon controller of the Bitstream 3X. Touching the ribbon

produces gestural bursts of sound, while the X-Y control is mapped to the various effect controls and 5.1 spatialisation (so that the X-Y position directly correlates to the spatial location of the sounds).

4.3 Drone Machine

The centre top module in figure 2 is a granular synthesizer, which is configured specifically for creating drones through a process of granular time-stretching. The drone machine is controlled via sliders 5 and 6 of the Bitstream 3X, which are mapped to control the sample location and the volume of the module. Various other controls (the dials above sliders 5 and 6) allow aspects of the grains to be adjusted, and control effect processing and spatialisation. Two of the dials also control a supporting bass drone that is created with a sine wave signal generator.

4.4 Dj Mixer

The dj mixer module provides the facility to trigger pre-planned supporting material in a spontaneously designed sequence, in the style of a continuous dj mix. Channels A and B contain 3 sound file players each which can be mixed together using the cross-fader, and any of the 6 sound file players can be started/stopped at will. These sound file players are intended for use with pre-designed sections of music or short sound clips. These can then be introduced into the performance to create a supporting context and structure for the entoptic and droning sounds. The implementation and sequence of pre-planned material can be adapted for each performance, incorporating spontaneity into the structure through live remixing.

5. ENTOPTIC PHENOMENA

Entoptic Phenomena (duration 5:44) is a fixed electroacoustic work. The structure of the piece is informed by the descriptions of ASC experiences provided by Klüver and Strassman’s participants. I have provided some quotations through the course of my discussion to illustrate typical features of an ASC experience that were used as a basis for the conceptual design of sonic material. The piece is not directly based upon these quotations however; there is some degree of artistic interpretation and musical choice involved. The sonic material discussed was mostly produced using the *Atomizer Live Patch*, though additional manipulation and arrangement also took place.

The structure of the composition is based on the progression of a hypothetical DMT experience, with an approximately equivalent time-frame; DMT is a powerful hallucinogen with a fast onset and a short duration:

‘The onset of the experience is rapid, the experience being very intense with the higher doses within 30 seconds. It peaks within 2 to 5 minutes and is usual felt as only a mild intoxication within 20 to 30 minutes.’ [19]

Entoptic Phenomena begins and ends with the recognisable sounds of an isolation tank, where it is imagined this hypothetical experience might take place. The real-world sound of the isolation tank is followed by various sounds that correspond to aspects of the illusory components of hallucination, before the listener returns to the real-world sounds. Figure 3 shows how the piece is structured around a hypothetical ASC experience, with onset, plateau and termination. The three sections are based upon different experiences that might occur in a hallucination. Onset and termination use the principle of entoptic phenomena, while plateau uses the notion of entoptic phenomena that has become

abstracted into an interpretation of a hallucinatory space, accompanied by a sense of timelessness and strange voices.

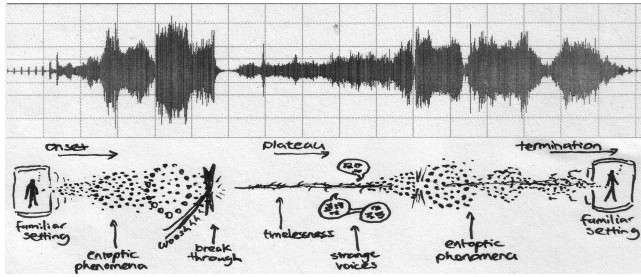


Figure 3. Entoptic Phenomena, illustration of structure. Copyright © 2010, Jonathan Weinel.

From 0:01-0:54, a progression is heard from recognisable sounds to layers of unfamiliar/abstract entoptic sounds. This reflects the onset of visual patterns of hallucination in an ASC experience:

‘There was a sound, like a hum that turned into a whoosh, and then I was blasted out my body at such speed, with such force, as if it were the speed of light. The colours were aggressive, terrifying; I felt as if they would consume me, as if I were on a warp-speed conveyer belt headed straight into the cosmic psychedelic buzzsaw.’ [20]

Strassman’s participants often described an initial wall of ‘spinning colours’ [21] or similar which they must break through during the DMT experiments. From the descriptions, we can reasonably categorise these ‘spinning colours’ as entoptic phenomena. At 0:57-1:55 the main burst of entoptic sounds can be heard. In this section you can hear the streams of fast rhythmic and micro-rhythmic sounds that are produced by the atomizer module. These reflect the entoptic phenomena and visual patterns of hallucination described by Klüver and Strassman. The organisation of rhythmic sound into grid formations reflects Klüver’s grid and lattice form constants. Using spatialisation effects such as Doppler (heard prominently at 1:30-1:37), these move in a circular motion which is mimetic of the tunnels and spirals perceived in entoptic hallucinations; pin-point tunnels of light become rapid spiralling rhythmic sound, like the ‘spinning colours’ described in the quotation.

‘The spaces between the wires seem brighter than the wires themselves. Now the wires shine like dim silver in parts. Now a beautiful light violet tint has developed in them.’ [22]

Most descriptions of entoptic phenomena in Klüver and Strassman’s studies describe temporal shifts and changes to the visual patterns perceived. The changes in brightness and colouration that Klüver’s participant describes are reflected mimetically by using effects such as filter, delay and ring modulator. The use of these effects can be heard during 0:57-1:55. A short delay creates a metallic effect, while ring modulator and filter effects provide transformations and colouration of the sounds.

‘...the most intense part of each trip was spent tangled up in these colours. This time, I quickly blasted through to the “other side.” I was in a void of darkness. Suddenly, beings appeared. They were cloaked, like silhouettes.’ [23]

During the section 1:45-1:55 a ‘whoosh[ing]’ crescendo ending in silence can be heard. This reflects ‘[blasting] through’ the entoptic phenomena. These sounds give way to a spacious drone

atmosphere in the middle section, heard from 1:56-3:20. This reflects an ambiguous mystical phase of the experience, as typically described in Strassman’s study. Droning sounds are used in accordance with the distortions to time perception that may be perceived during this phase of an ASC experience. Heavily processed (unrecognisable) voice sounds (heard from 2:04 onwards) are used in correlation with the reports of strange beings or entities that Strassman’s participants describe.

‘...it was quite rare for volunteers to hear formed voices or music. Rather, there were simply sounds, variously described as “high pitched”, “whining and whirring”, “chattering,” crinkling and crunching.” Many remarked on the similarity of DMT auditory effects to those of nitrous oxide, where there is a “wah-wah,” oscillating, wavering distortion of sounds.’ [24]

The third and final section of the composition heard from 3:35-5:20 reintroduces entoptic sounds, corresponding with the return of visual patterns of hallucination. These are accompanied by high-pitched sounds and a ‘wah-wah’ modulation of the drones from the previous section. The combination of entoptic and drone sounds used creates textures that resemble the description of sounds in the quotation above.

In an ASC experience produced by drugs, it is usual for the effects to eventually subside. In accordance with this the composition concludes by returning to the familiar sounds of the isolation tank (5:20-5:44), which were heard at the beginning. This reflects the DMT participants’ rapid return to normal consciousness after only a few minutes.

As discussed previously, Entoptic Phenomena can be considered in terms of Kendall’s discussion of the potential of electroacoustic music to construct journeys through imaginary spaces through sound. The approach of beginning with recognisable sound (indicating a real-world sound sources), before progressing to illusory sound (indicating hallucinated sound sources), can also be compared to Barry Truax’ compositions *The Shaman Ascending* [25] and *Chalice Well* [26]. In *Chalice Well*, Truax begins the piece with the sounds of an actual well, representing a real world location around which the piece is based. Following this, Truax moves the listener down the well and into imaginary audio spaces that represent the underworld. The approach used in *Entoptic Phenomena* is essentially similar, since it also utilises real-world and imaginary (hallucinatory) sound materials. However it differs in that the design of the imaginary spaces are partially based-on research concerning what people say they actually experience in ASC.

6. TINY JUNGLE

Tiny Jungle (duration 7:10) develops the concept of ASC and visual patterns of hallucination as a basis for an audio-visual composition. The piece uses the concept of a visionary journey or flight, which informs the use of hand-drawn artwork and 3D graphics. I discuss this piece in more detail elsewhere [27], so here I will provide a brief overview of the piece in order to show how visual patterns of hallucination are represented in the context of an audio-visual piece based on ASC.

The audio composition of the piece utilises the approaches of late 90s jungle and drum and bass, such as fast-syncopated rhythms. Drones feature significantly, which were intended to reflect distortions to time perception, such as may occur during an ASC.

The piece is structured into two main sections (or ‘phases’), which correspond with different ASC states. The first ‘ergotropic’ phase reflects ecstatic states that promote expenditure of energy, as

discussed by Fischer [28]. This is reflected through use of fast tempo rhythms and visual material, produced through using strobing effects and fast moving 3D objects. Strobing effects were produced using the *Atomizer Visual* [29]: a specially designed Max/MSP/Jitter patch, which enables multiple streams of visual material to pulse rapidly on screen. Slower repetitive rhythms and visual forms are used in a later section to reflect ‘trophotropic’ states of meditation and relaxation. Fischer’s energy states thereby provide a basis for the musical structure of the piece, which relates to a journey through ecstatic and meditative modes of consciousness. Some overlap between these sections and temporary deviation is allowed in the piece. Figure 4 illustrates how ergotropic and trophotropic principles inform the two structural ‘phases’ of the piece. This figure also shows how an ASC narrative is developed visually using various forms to indicate a hallucinatory journey. These include landscapes, entoptic phenomena, a forest and various other mysterious forms.

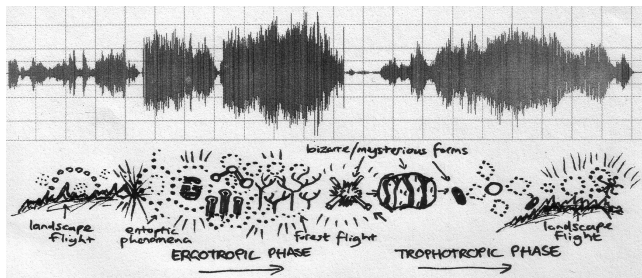


Figure 4. *Tiny Jungle*, illustration of structure. Copyright © 2011, Jonathan Weinel.

Entoptic phenomena are described visually in this piece using various methods. I use hand-drawn circle and dot patterns, animated in After Effects (1:00-1:30). A kaleidoscopic filter is applied to re-process visual material, creating a similar effect to the entoptic form constants in figure 1 (0:15). Finally, I created tunnels of spheres using 3D graphics, which a camera flies through (2:37-2:50). Examples of these methods are shown in figure 5.

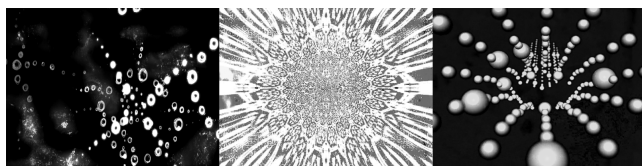


Figure 5. Entoptic phenomena in *Tiny Jungle*. Copyright © 2010, Jonathan Weinel.

The other visual forms used in *Tiny Jungle*, such as landscapes, mysterious forms, spaces or shapes reminiscent of molecular or atomic forms, are more loosely based on the descriptions provided by Strassman’s participants of their DMT experiences (after ‘breaking through’).

7. DISCUSSION

The suggested historical significance of visual patterns of hallucination as a subject for artwork makes them an interesting prospect to explore through modern digital arts techniques. *Entoptic Phenomena* shows a possible approach to representing these patterns through sound, while *Tiny Jungle* demonstrates these patterns through visual material.

For *Entoptic Phenomena*, the *Atomizer Live Patch* enables the production of streams of rhythmic sounds that reflect this aspect of ASC experiences mimetically. Since producing *Entoptic Phenomena*, I have used this tool for various other pieces

including *Swamp Process* [30], *Nausea* and *Entoptic Phenomena in Audio*; an expanded 20:00 version of *Entoptic Phenomena* that is performed live using the software [31]. This live version of the piece is realised in multichannel, improving the correlation between the circular forms of entoptic phenomena and the circular motion of entoptic sounds using the doppler spatialisation. *Nausea* also uses surround sound to achieve a similar effect. I have made the *Atomizer Live Patch* available through my website, and it has seen some use by flashcore artists such as Atomhead.

Tiny Jungle uses entoptic phenomena as a principle for the design of visual forms. The work shows a variety of possible approaches for doing so, using hand-drawn and computer graphics techniques. In future works I may be able to further integrate audio and visual approaches, in order to develop a synaesthetic language for compositional sections based on entoptic phenomena.

The use of visual patterns of hallucination as a basis for the design of visual music may be particularly interesting, since the form constants are similar to the geometric shapes seen in many other works of visual music, interactive visualisations and related projects. Therefore, ASC may provide a useful basis for the design of such forms. Eventually, cross-disciplinary research between the fields of psychology and visual music may enable us to develop highly accurate representations of visual patterns of hallucination, which further our knowledge and understanding of ASC. Combining this with biofeedback technology might enable us to simulate hallucinations using digital technology.

Using research regarding visual patterns of hallucination to inform the composition of visual music might be new area of enquiry. However, the connection between visual music and ASC has some history. Harry Smith was known to use sleep deprivation to inspire his works, such as *Early Abstractions* [32]. Mandala forms are also evident in John Whitney’s work, such as *Permutations* [33]. As Blackmore discusses, Jung saw mandalas as archetypal symbols of the collective unconscious that were perceptible during dreams [34]. Such perceptions of mandalas may in fact be abstractions of the same entoptic form constants seen in hallucinations, says Blackmore. Therefore, the use of visual patterns of hallucination as a basis for the design of visual music may be seen as very much in the tradition of these two visual music pioneers.

In this article I have described a possible approach through which ASC and visual patterns of hallucination can be used as a principle for composing audio and audio-visual works. In future I hope to further develop the ‘break through’ passages of my pieces. Strassman’s participants describe all manner of bizarre encounters in these phases of the experience; visual patterns of hallucination were considered only to be a distraction. Similarly, Klüver’s study describes entoptic phenomena coalescing into other abstracted forms and illusions. Analogously then, the composer’s challenge is to ‘break through’ entoptic phenomena and find a deeper language to describe what lies beyond.

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