Author copy/draft of the introduction chapter for *Explosions in the Mind: Composing Psychedelic Sounds and Visualisations* by Jonathan Weinel (Palgrave Studies in Sound, 2021).

Chapter 1

Introduction

Imagine a trickling sensation at the back of the head, and a series of yawns, as if waking into a dream. The grain of the wood floorboards begins to move, flowing like water in one moment, fading back into place in the next. The shelves of a bookcase begin to resemble a grinning face. As water flows down the drain in the bathroom, it seems to take on a vocal quality, as if saying something in a recognisable, slightly humorous accent. Listening to music, the sound stage opens up — instruments seem more spatially separated and have a sparkling, high fidelity quality. Upon closing your eyes, you begin to see multi-coloured geometric funnels, racing webs of repeating patterns, and animated caricatures that flicker and dance to the music. In one instance, these are like detailed pencil portraits, which morph into doves and take flight, before assembling into a gateway of skulls leading down into an underworld. Moments later cartoon dogs made of red, white, and blue electricity pick their noses and DJ, scratching records rhythmically to the beat. Now waves of intricate luminous patterns emerge from the doors of a cupboard. Like Persian rugs rendered in 3D, they cycle through complex iterative variations as they flow across the room, one after the other. Cryptic messages resembling a sixteen-segment LED display scroll across the carpet, while blocky angular robots and circuit boards gyrate in mid-air. Gradually these impressions fade into soft flickering traces, as the distant sounds of farmyard animals and fresh countryside air punctuates the room in the first rays of the morning light.

Episodes of hallucination such as these can be precipitated by psilocybin mushrooms, such as the 'liberty caps' (*Psilocybe semilanceata*), which can be found throughout the British Isles in the misty weeks of September before the frost sets in (Cooper, 1977, pp.16–17; Phillips, 2006, p.251)[1]. During such episodes, one may experience auditory or visual hallucinations. When visual hallucinations are formed in response to music, they can be understood as a form of synaesthesia, since the auditory sense acts as a stimulus for the visual impressions. It has often seemed to me that these 'explosions in the mind', in which the human psyche unfurls intricate webs of neon geometry, rapidly cycling animations, and cavalcades of absurd caricatures, would provide an excellent basis for the design of art and music. Furthermore, as a child of the 1980s raised on Atari STs and Betamax video cassettes, it is my view that the intense glow of computer pixels and crisp digital audio provides the ideal medium in which to sculpt such psychedelic sounds and visualisations. These technologies offer flexibility, whereby in principle, any visual or sonic impression, real or imaginary, can

be designed, so long as one is able to translate it into a concrete form. How this can be achieved is the subject of *Explosions in the Mind: Composing Psychedelic Sounds and Visualisations*.

The idea of representing psychedelic hallucinations became the seed for over a decade of creative practice, which I undertook across multiple areas, ranging from electroacoustic music to various areas of audio-visual composition, including video jockey (VJ) performances, interactive projects, and virtual reality (VR) applications. These works, and how they were realised, is the main focus of this book. In these pages I will discuss compositional strategies for translating auditory and visual hallucinations into sound, and designing synaesthetic visual materials in correspondence with sound. These strategies are by no means trivial — after all, how exactly *does* one begin to design sounds or audio-visual materials that represent ephemeral subjective states, such as psychedelic experiences of synaesthesia? Visual and aural impressions that one sees and hears from a first-person perspective can be approximately represented using cameras and microphones, which may be used to capture similar patterns of light and sound to those that stimulate the senses. However, this approach cannot easily be used to represent hallucinations, where seemingly, the visual and aural perceptions one has do not originate in the surrounding physical environment. There is no 'video capture device' for the mind's eye, yet, with an idea of what may typically be seen or heard in a hallucination, one can attempt to design sounds and images that represent these perceptual experiences. How this can be practically approached through electronic music and audio-visual composition will be explored in *Explosions in the Mind.* Through the course of the book, I will uncover a set of design frameworks that can be used for representing psychedelic states, ultimately revealing how one may compose psychedelic visualisations of sound across a variety of media. In doing so, my aim is to provide a useful resource for creative practitioners and researchers, especially those working in fields such as electronic music composition, sound design, audio-visual composition, video games, and VR development.

To begin, in this chapter I will first provide a discussion of altered states of consciousness (ASCs), focusing in particular on the phenomenon of psychedelic hallucinations and experiences of synaesthesia that occur in response to sound. Following this, I will provide an overview of existing works of art and music that seek to either represent or induce psychedelic states in a variety of ways, thereby providing the backdrop and wider context for the compositional practices discussed throughout the book[2]. Specific attention will also be directed towards existing psychedelic visualisations, which can be found in various forms of experimental film, VJ performance, music visualisations, video games, and VR applications. I will then proceed to outline the areas of electronic music and audio-visual

composition that I have undertaken as practice-led research, which will be discussed in the upcoming chapters.

<1>**Psychedelic Experiences**

Psychedelic experiences, such as those elicited by hallucinogenic mushrooms, can be understood as a specific form of 'altered state of consciousness' (ASC). The term ASC was coined in the 1960s and describes a range of perceptual or experiential states such as dreams, hallucinations, meditations, trances, or hypnotic states (Ludwig, 1969). It can be difficult to define precisely what qualifies as an ASC, since we may presume that our conscious experience fluctuates constantly throughout the day, and also varies between individuals. Accepting these limitations, the ASC term is nonetheless useful as a general description that allows us to talk about points of significant divergence from a commonly accepted 'normal-waking consciousness'. The caffeine in your morning cup of coffee probably induces something we might consider a very mild ASC, but generally speaking, when using this term we are talking about something a bit more out of the ordinary, which is unlikely to go as well with croissants and reading the newspaper.

These extraordinary states can be induced through various means. For example, synthetic drugs or intoxicating plants found in nature may induce perceptual changes such as hallucinations. However, hallucinations may also occur without the use of drugs, as in cases of sensory deprivation, which can be elicited with sensory isolation tanks, which suspend the body in complete darkness. While reducing the senses in this way seems to elicit hallucinations, overloading them may also provide an alternative route for inducing ASCs. We see this in the various indigenous trance ceremonies found across the globe, where music, dance, and the spraying of liquids induces states of sensory overload in which participants believe they are possessed by spirits (Rouget, 1985). Hallucinations can even occur due to extreme forms of hunger or fasting, such as may be experienced by explorers low on supplies in perilous environments in the extremities of the desert or Antarctic. While these are roads seldom travelled by most people, perhaps more familiar to the reader will be experiences of dreaming, which can also be viewed as a form of ASC analogous to a hallucination that occurs during sleep (Hobson, 2003). Lucid dreams, in which one is aware that they are dreaming, can have particularly intense, hallucinatory qualities; while on the threshold of sleep it is also possible to have hypnogogic hallucinations, as in cases of 'sleep paralysis', where one may perceive strange terrifying beings or daemons (Hufford, 1989).

ASCs may be characterised by a range of effects. While these may vary between types, 'ASC features' may include disruptions to thought patterns and awareness, or distortions to time perception, in which moments may seem to pass more quickly or slowly

than usual. The hippie on a deep, spiritual acid trip knows this at the peak of the experience, where the cosmic enormity of the pulsating universe weighs heavily and time dilates. In such experiences, one can expect visual hallucinations, as intricate geometric patterns unfold on the backs of closed eyelids. Though less common, auditory hallucinations or other sensory distortions to smell or taste may also be experienced. An altered sense of self may be described during some ASCs, so that one feels as though they have been overtaken by mystical forces, as in the case of possession trances in Haitian Vodou ceremonies, where spirits are believed to enter the dancing body of the trancer. Heightened emotions are often desired, and it is these that are sought by the raver, who hands over crumbled bank notes for some MDMA (3,4-methylenedioxymethamphetamine), so they can spend a few fleeting hours chasing waves of euphoria and ecstatic bliss, dancing to pounding techno music with saucer-wide pupils, until the inevitable crash the following morning. During some ASCs, the feeling of body weight may change, and this is something the psychonaut[3] may try to engineer by combining their psychedelic trip with other drugs such as nitrous oxide, which have dissociative anaesthetic properties. In sleep states such as lucid dreaming, or hypnogogic hallucinations, it is even possible for one to experience weightlessness, levitation, or flight. Indeed, there is even suggestion that the legend of witches flying on broomsticks may be related to the effects of psychoactive compounds used in European witchcraft (Harner, 1973). In general, ASCs can be varied and highly subjective, but there are often commonalities between experiences of a given type, which emerge from the many reports available in the surrounding literature[4].

Various systems have been devised that allow us to classify different types of ASCs. For example, Fischer's (1971) 'cartography of ecstatic and meditative states', provides a continuum ranging from 'ergotropic' (promoting energy expenditure) to 'trophotropic' (promoting energy conservation) states. This model allows us to consider the energetic properties of ASCs, where deviation from normal-waking consciousness corresponds with points of extreme high or low activation. By focusing on energy levels, Fischer's cartography has some similarities with Russell's (1980) 'circumplex model of affect', a two-dimensional model of emotion often used in contemporary cognitive psychology, in which the *x* axis describes 'valance', ranging from pleasant to unpleasant; and the *y* axis describes 'arousal', ranging from high- to low-energy states. Fischer's model also informed Rouget's classic study *Music and Trance: A Theory of the Relations Between Music and Possession* (1985), in which the author investigated various global cultures where music was being used in shamanic or possession trance rituals. Here, Rouget proposed that music may be involved in the production of low-energy 'ecstatic' states (similar to meditation in his usage[5]), which are typically experienced in quietness and solitude; or high-energy 'trance' states, which may

occur in situations of sensory overload where the various senses are bombarded through music, dance, and the spraying of liquids.

Expanding on this topic, Fachner (2011) suggests that music can be used to structure the temporal experience of rituals that produce states such as trance. For example, in Haitian Vodou rituals, percussive drumming may contribute towards states of sensory overload, inducing trance states; whilst in Amazonian shamanism, sound-making instruments may focus the attention, or invoke spiritual symbols that shape the experience. These debates emphasise music as a signalling force that is used in specific cultural contexts, which according to Becker's (2004) analysis, may trigger trance states in particularly susceptible individuals, whom she terms 'deep listeners'. Rouget also recognises a general association between quickening tempos and states of trance, which corresponds with Gabrielsson and Lindstrom's (2012) later meta-study of music and emotion, in which they found that quick tempos and percussive music were often associated with high arousal states, while slower tempos and sparse percussion were associated with low arousal. All of this points towards the idea that music can be designed in certain ways in order to promote high- or low-energy experiences, and this is an idea that will be discussed later on in *Explosions in the Mind.*

Also of interest for our discussion in this book is Hobson's (2003) 'state-space' concept of consciousness, which uses a neurologically-based 'activation, input, modulation' model. According to this model, 'activation' describes states of high or low brain activity; 'input' relates to different sources of sensory experience, which may originate in the external environment, or arise internally in the brain; and 'modulation' describes how events are recorded to memory. According to this model, during a typical 24-hour cycle a person undergoes various changes to activation, input, and modulation, and moves between different points on the model. For example, in normal-waking consciousness activation may be high; input may arise predominantly from the 'external' surroundings; and events may be recorded to memory. In contrast, during sleep states activation levels may vary; input is predominantly 'internal' while dreaming; and much of what is experienced is not recorded to memory and will be quickly forgotten.

Throughout *Explosions in the Mind*, Hobson's (2003) distinction between 'internal' and 'external' inputs will be particularly useful, because these terms allow us to distinguish between the unreality of dreams and hallucinations that arise 'internally', and sensory stimuli that originates in a real, 'external' physical environment. Some additional clarity will be useful here, since prima facie consciousness would seem to *always* involve processes of cognition internal to the individual. If we follow an enactive view of consciousness (Maturana and Varela, 1998), an organism is systemically arranged with respect to its surrounding environment, and thus the internal must always be negotiated in relation to an external. From this perspective, even sounds heard in dreams or hallucinations might find their basis in an

'external' environment, for instance, if they are related to memories of past experiences. What is important to emphasise here, however, is that the 'internal' and 'external' labels refer only to the current *inputs* of the sensory information, and these will always be subject to further processing within the perceptual system. When understood in these terms, the 'internal' and 'external' classifications provide a useful means for distinguishing between the respective channels from which sensory experience emerges at a given point in time. For our purposes in this book, normal-waking consciousness is typically oriented towards 'external' sensory inputs that originate from patterns of light and sound in a person's immediate physical surroundings, while dreams or hallucinations predominantly emerge from 'internal' sensory inputs that arise from memories and the imaginative faculties of the mind. These are not binary distinctions, so while sensory experience may emphasise one or the other at a particular point in time, there will usually be some form of negotiation happening between the two.

Whilst ASCs cover a variety of possible perceptual states, of particular relevance for many of the compositions discussed in this book are the psychedelic states produced by hallucinogenic substances such as LSD (Lysergic acid diethylamide), psilocybin mushrooms, or DMT (*N,N*-dimethyltryptamine). Although psychedelic experiences produce varied effects depending on the mind-set and situation of the individual (or, 'set and setting', to use the phrase popularised by Timothy Leary in the 1960s), there is some commonality with regards to the *form* of these experiences, which may be comparable between individuals. For example, psychologist Heinrich Klüver (1971, p.66) carried out participant studies to investigate the effects of mescaline, a hallucinogenic compound that occurs naturally in cacti such as peyote (*Lophophora williamsii*), which can also be produced synthetically. Klüver described 'form constants': honeycomb, cobweb, funnel, and spiral forms, which were commonly perceived by his participants. According to his study, in the earlier stages of hallucination, one will see patterns related to the form constants, while later these may give way to figurative hallucinations of places, people, or animals. In later stages, as the effects wear off, one may also see visual impressions related to the form constants. Similar visual patterns were also reported in Strassman's (2001) studies of DMT, in which his participants often described geometric patterns in the earlier stages of intoxication, before subsequently 'breaking through' to encounter hallucinations of strange beings, entities and environments. During these episodes, auditory hallucinations were relatively less common, but are also sometimes described, and may include various forms of music, oscillating noises, high frequency tones, or voices. For example, one participant in Strassman's DMT studies referred to ‘high pitched’, ‘whining and whirring’, ‘chattering’, ‘crinkling and crunching’ sounds (p.148)[6].

Psychedelic hallucinations seem to promote experiences of synaesthesia, a phenomenon in which blurring across the sensory modalities occurs; for example, sounds

may have a smell, or colours may have a taste (Cytowic, 1989). There is a particular phenomenon, which is often reported during psychedelic experiences, of 'sound-to-image' hallucinations, in which sound triggers corresponding visual hallucinations (Bliss and Clark, 1962, p.97). This effect may be partly explained by recent neurological research, which suggests that psychedelic drugs such as LSD precipitate heightened states of interconnectivity in the brain, causing stronger associations between regions than would normally be present (Carhart-Harris et al., 2016b). In normal-waking consciousness, sound may trigger associative memories, visual images, or emotions[7]. We know this from research in sound and multi-modality, which confirms that the auditory cortex provides various forms of multi-modal integration (Purves et al., 2001). For example, the 'McGurk effect' (McGurk and MacDonald, 1976), showed that seeing different mouth movements caused participants to hear different phonemes from the same acoustic stimuli; and various other studies have also shown that activity in the visual cortex can stimulate the auditory cortex (e.g. Calvert et al., 1997; Callan et al., 2003). In a psychedelic state, heightened interconnectivity in the brain may provide an increased sensitivity to these multi-modal effects, so that associative properties of sound are manifested as visual impressions.

The experience of psychedelic visual hallucinations in response to sound is a pivotal theme of this book, around which much of my compositional practice revolves. As we shall see through subsequent chapters, many of my earlier works such as electroacoustic compositions are explicitly based on the idea of representing visual or auditory hallucinations. These works use typical 'ASC features' described in the literature to inform the design of the compositions. Later however, the connection with psychedelic states becomes more implicit. For these works, I utilise a process in which the design of visual materials is related to the associative properties of sound, thereby adopting a similar mechanism to that which occurs in sound-to-image hallucinations, without necessarily referencing specific accounts of psychedelic states directly. Whilst the design of these works depends less overtly on the idea of ASCs, they can be considered as 'psychedelic visualisations of sound', because they imitate the mechanism that occurs during psychedelic experiences of synaesthesia, where the manifestation of visual sensations occurs in response to sound.

<1>**Psychedelic Art and Music**

While elsewhere I have provided an extensive, wide-ranging analysis of art and music related to ASCs (Weinel, 2018d), before we begin discussing compositional strategies, it will be useful to provide a brief tour through the wider cultural context for psychedelic art and music. ASCs have been present in human culture for thousands of years. For instance, Lewis-Williams and Dowson (1988) suggested that prehistoric shamanic rock art designs

represented honeycomb, cobweb, funnel, and spiral patterns similar to the form constants described by Klüver (1971). Although this theory has been contested (Lewis-Williams, 2007; Dowson, 2007; Luke, 2010), there are various other ancient cultures where ASCs seem to have played an important role. For example, Australian Aborigines have used the stimulant pituri for thousands of years as a means to access dreamtime (Schultes, Hofmann, and Rätsch, 1996); the Ebers Papyrus indicates opium use in ancient Egypt (Merlin, 1984, pp.274–275); the Rig Veda, a sacred Aryan text of the Indus Valley, describes the ecstatic drink 'soma' (Wasson, 1968; Flattery and Schwartz, 1989; McKenna, 1992, p.120); and a hallucinogenic drink seems to have played a central role in the Eleusinian Mysteries, an initiation cult in Ancient Greece (Eliade, 1978). For thousands of years, shamanic societies have used intoxicating plants to access visionary states in which a shaman communicates with a 'spirit world' (Eliade, 1964; Vitebsky, 1995). For example, *Amanita muscaria* mushrooms are used in Siberian shamanism; in North America, Native Americans use the peyote cactus in religious ceremonies; *Psilocybe cubensis* mushrooms are used by the Huichol and Mazatec peoples of Mexico; whilst the hallucinogenic brew ayahuasca (which contains an orally active form of DMT) is used in the shamanic practices of the Amazon rainforest. Whilst Europe became oriented towards an alcoholic drinking culture that survives today (Sherratt, 1995), there is also suggestion that intoxicating plants were once used as 'hexing herbs' in witchcraft (Harner, 1973).

In modern Western society, psychedelic hippie culture emerged in the 1960s. First synthesized by Albert Hoffman in 1938, LSD was initially used in psychotherapy trials, but soon found popularity in the 1960s counter-culture, due to its 'consciousness expanding' effects. These effects struck a chord with the youth culture of the time, who in the midst of various social, political, and sexual revolutions, were interested in altering perception to find different ways of thinking and being that challenged established societal norms. LSD was subsequently outlawed in the United States, with most other Western countries following suit. Other novel psychoactive compounds that were discovered by Alexander Shulgin in the 1970s, such as the euphoric stimulant MDMA, and the psychedelic drug 2C-B (2,5-dimethoxy-4-bromophenethylamine), were similarly banned. Nonetheless, these substances became available on the black market, and in the late 1980s MDMA was widely used by revellers at all-night dance parties in rave culture. Though various substances wax and wane in their popularity over the years, underground use of drugs, psychedelic or otherwise, is on going. In recent years however, there has also been a resurgence of interest in the therapeutic use of psychedelics for treating posttraumatic stress disorder (Mithoefer et al., 2010) and other conditions such as alcoholism (Bogenschutz and Johnson, 2016).

Across these various cultures of intoxication, perhaps not surprisingly, we find a great deal of art and music that responds to ASCs, or may even be used to induce them. Visual

artefacts produced by shamanic cultures may represent visionary states, while music may actually be used to conduct the ritual. For example, Lewis-Williams (1996, p.28) discusses San rock art (of South Africa), which he says depicts circles of figures taking part in trance rituals. Swan (1999) provides extensive documentation of Native American artefacts, many of which display patterns and spiritual symbols related to peyote rituals, in which traditional songs are sung, sometimes with percussive accompaniment (as documented on Harry Smith's *Kiowa Peyote Meeting*, 1973). In the shamanic practices of Central America, the Huichol people create distinctive 'yarn paintings', which include colourful symbols related to visionary experiences (Berrin, 1978); while Mazatec mushroom rituals (as documented on María Sabina's *Mushroom Ceremony of the Mazatec Indians of Mexico*, 1957) may involve singing and clapping in which mushroom spirits are believed to speak through the shaman (Wasson et al., 1974). Among the Tukano people of the Amazon rainforest, zigzag, lattice, star and spiral designs that are rendered on the walls of buildings are related to ayahuasca visions (Reichel-Dolmatoff, 1978), in which the elders chant and hum (as documented on Brian Moser and Donald Tayler's *The Music of Some Indian Tribes of Colombia*, 1972). Elsewhere in the Amazon, the Shipibo people make distinctive *ronin quene* (snake designs), which are based on ayahuasca visions (Gebhart-Sayer, 1985, p.162). Interestingly, these are understood as 'design medicines', and are also translated into songs by the shaman, in a manner that perhaps points towards the synaesthetic qualities that are in inherent in visionary experiences.

In Western culture, ASCs have provided a point of inspiration for various forms of visual art, literature, and film. For example, John Uri Lloyd's *Etidorhpa* (1895) describes a hallucinatory journey based on a hollow-earth theory. In the early twentieth century, drawing on Freud's (1899) theories of psychoanalysis, the surrealists were interested in making films and paintings that invoked a sense of dreams or the unconscious. A notable film from this period that remains a visceral viewing experience to this day is *Un Chien Andalou* (Buñuel, 1929, made in collaboration with Salvador Dalí), which utilised shocking juxtapositions of imagery to produce an irrational experience for the viewer. In the 1940s and 1950s, avant-garde filmmakers such as Maya Deren created films that follow protagonists undergoing dreams, rituals, or possession trances, forming a category that Sitney (1979, p.21) refers to as the 'trance film'. Also around this time, Henri Michaux (2002) produced fascinating and highly detailed ink drawings based on his experiences of mescaline.

Following this, with the arrival of the 1960s counter-culture there was an explosion of psychedelic artwork, in which the effects of LSD seem to have influenced various areas of visual culture towards brightly coloured, mind-warping designs. Perhaps the best evidence of this can be seen in the melting neon letters and geometric patterns of poster design for psychedelic rock concerts in San Francisco and elsewhere (Grunenberg, 2005). In the 1960s there were also numerous literary works that described ASCs, such as Paul Bowles's *A*

Hundred Camels in the Courtyard (1962), which uses a literary mosaic technique to reflect the effects of smoking hashish; or Carlos Castaneda's *The Teachings of Don Juan: A Yaqui Way of Knowledge* (1968), in which the author describes visionary journeys and experiences of metamorphosis. This decade saw a great deal of experimentation in filmmaking, as seen in both mainstream 'hippie exploitation' films such as *The Trip* (Corman, 1967) or *Psych-Out* (Rush, 1968), as well as underground productions by groups such as USCO, which sought to overload the senses with tape effects and spinning imagery, as seen on films such as Yalkut's *Turn, Turn, Turn* (1968). As documented by Rubin (2010), psychedelic stylisations echo through various subsequent forms of visual art to the present day, and disperse into many strands of artistic work, from the hallucinogenic graffiti of Kenny Scharf, to the visionary symbolism of Alex Grey's paintings.

Music was at the centre of psychedelic culture in the 1960s and 1970s. Bands of this era adapted the form of rock n' roll by incorporating psychedelic themes and sounds, through lyrics, tape effects, and guitar pedals (such as flangers, wah-wahs, and fuzz boxes). In the studio, even more experimentation was possible through production techniques using tape loops. These techniques can be heard on recordings by 'garage rock' bands (such as those featured on the *Nuggets: Original Artyfacts from the First Psychedelic Era, 1965-1968* compilation, Various Artists, 1972); albums by artists such as The Jimi Hendrix Experience, The Beatles, Pink Floyd, Cream, The Rolling Stones, The Grateful Dead; and others. Johnson and Stax (2006) discuss these approaches, also noting the introduction of exotic sonic material derived from Eastern influences, which may support the 'otherworldly' quality of the music for Western audiences. Psychedelic forms of rock music can be traced through the decades that followed to the present day, via related genres such as space rock or stoner rock. There are also various other popular music genres that similarly incorporate hallucinatory stylisations, often through means of tape effects or electronic processing. For example, Michael Veal (2007) describes dub reggae as a form of 'psychedelic Caribbean music', and there are clear parallels to be found in this genre via the experimental use of tape, echo, and reverb.

The approaches of psychedelic rock and dub were among those that were influential on the electronic dance music culture of the 1980s and 1990s (Collin, 1998; Reynolds, 2008), and a myriad of other associated genres such as drum & bass, trip-hop, ambient techno, and psy-trance. In various ways, these electronic dance music genres wrap forms of psychedelic sound design and sampling around energetic rhythms and beats, providing rave music that is tinged with acidic and hallucinogenic qualities. Electronic dance music producers do not always take drugs, and neither do the audiences of this music, but there is a proximity to drug use in these genres that means psychedelic themes are often close at hand. As St. John (2009) discusses, electronic dance music may well be used in combination with drugs, where these

sounds are likely to be complementary, but above all it is the music that appeals to audiences, and these sounds may even have the potential to elicit collective trance-like experiences of dance.

Of special significance for this book are also those works of electroacoustic music[8], which connect with ideas of dreams, hallucinations, or unreality. Electroacoustic music is not usually seen as part of psychedelic culture, however there are examples that relate to various concepts of ASCs, by using electronic manipulations of sound to elicit dreamlike aural experiences. A notable work that achieves this with striking success is Michael McNabb's *Dreamsong* (1978), which transitions between recorded sounds that suggest a real-world location, and synthesizer sounds that indicate a dream world. Barry Truax has also created several significant works that traverse similar perceptual boundaries, such as *Pendlerdrøm* (commuter dream) (1997), which describes a travel experience in which a commuter lapses into a dream. In this case, the work was realised through various field recordings and computer-manipulated sounds, which allow Truax to move the listener between representations of normal-waking consciousness and dreaming, and thereby transitioning between 'external' and 'internal' points of Hobson's (2003) 'input axis'. Along similar lines, Truax's piece *The Shaman Ascending* (2004–2005), takes the concept of an Inuit shamanic ritual, and uses this to inform the organisation of sonic materials within the piece, in which droning vocal sounds rapidly circle around the listener within the spatial field. Several other composers have also explored approaches such as these. For example, Gary Kendall's *Ikaro* (2009–2010) is one of several compositions based on Peruvian shamanism, which incorporate soundscape materials to construct sonic experiences that are analogous to shamanic journeys. Mining similar territories, Adrian Moore's *Dreamarena* (1996) and Åke Parmerud's *Dreaming in Darkness* (2005) both use concepts of dreaming as points of creative departure. There is then a significant strand of electroacoustic work that explores notions of 'reality' and 'unreality' as a basis for musical composition. This area is important to highlight, because the compositional approaches that I initially explore in *Explosions in the Mind* emerge from the field of electroacoustic composition, and so these works have special contextual relevance.

<1>**Psychedelic Visualisations**

Of special importance for *Explosions in the Mind* are also those existing psychedelic visualisations, which can be found in various contexts ranging from experimental films and VJ performances to video games and VR experiences. In this section I will outline some of the main examples from these areas that are particularly relevant for *Explosions in the Mind,* while acknowledging this is by no means an exhaustive account of audio-visual practices, which reflect an increasingly broad spectrum.

'Visual music' is an area of visual art and experimental film in which works are designed based on the form and structure of music (Brougher and Mattis, 2005). Early examples of visual music include 'colour organs', which display lights in correspondence with sound (Moritz, 1997), and the paintings of Wassily Kandinsky, which interpret music through abstract symbols and shapes. However, the term is now more strongly associated with the films of artists such as Len Lye, Normal McLaren, Oskar Fischinger, Harry Smith, John Whitney, James Whitney, and Jordan Belson. In the mid-twentieth century these artists created striking short films in which shapes, patterns, and textures seem to move and dance around the screen in a way that reflects the rhythms, timbres, and melodies of music. As I discuss elsewhere (Weinel, 2018d, pp.127–129), some of these works are explicitly psychedelic, reflecting themes of meditation and hallucination. For example, Jordan Belson's films draw inspiration from meditation, providing cosmic journeys that contemplate the inner reaches of the human psyche and the outer limits of the galaxy. On his film *LSD* (1962), Belson uses various funnel patterns suggestive of Klüver's (1971) form constants. Belson was also involved in a series known as the Vortex Concerts, which used multiple speakers and projections in a planetarium to provide immersive spatial performances (Molloghan 2015, pp.72–74) that prefigure the audio-visual fulldome[9] performances of today. An associate of the beatniks, Harry Smith's work is also a particularly important reference point for *Explosions in the Mind* (see also Chapter 4), since his visual music films were partly inspired by experiences of synaesthesic sound-to-image hallucinations precipitated by psychedelic drugs and jazz music. Arguably ahead of his time, Smith even projected his films to live jazz performances and could be considered as a forerunner of today's VJs.

While visual music tends to be associated with fixed-media[10] work, the psychedelic lightshows of the 1960s and 1970s provided more live and performative approaches for visualising music. In New York the Joshua Light Show provided colourful projections to accompany rock concerts at venues such as the Fillmore East (Signore, 2007; Zinman, 2008); in London Mark Boyles and Joan Hills provided lightshows for the UFO club (Robinson, 2007); while the Manchester area was catered for by Nova Express (see Chapter 6, pp.TKTK). These lightshows utilised technologies such as overhead projectors with glass clock faces filled with coloured oils, inks, and other chemicals; slide projectors; and 16mm projectors. The groups manipulated these devices live, generating organic psychedelic textures and visual rhythms to accompany live performances by psychedelic rock bands of the day such as Pink Floyd.

In the 1970s and 1980s, music visualisers began to appear, which could automatically drive light synthesis patterns in response to audio. For example, the Atari Video Music (1976) was a piece of home electronics that could be connected to a hi-fi and TV in order to generate analogue diamond patterns in response to an audio signal. Designed for home computers, Jeff

Minter's light synths such as *Psychedelia* (1984), *Colourspace* (1986), *Trip-A-Tron* (1987), and the *Virtual Light Machine* (VLM, 1990–2003) provided more sophisticated forms of light synthesis that used FFT (Fast Fourier Transform) analysis (Bell, 2019). Iterations of the VLM were also featured in the Atari Jaguar and X-Box 360 video games consoles, allowing users to insert any CD from their collection and generate psychedelic visualisations of sound. In the early 2000s, music visualisers like these became a common feature in home computers on Mac and PC, via plugins such as Milkdrop, which were used with media players such as Winamp and iTunes.

The late 1980s and 1990s saw the emergence of electronic dance music culture, in which VJs provided a new kind of psychedelic lightshow that reflected the technological aesthetics of the music. Analogous to the role of the DJ, who mixes records to construct continuous aural journeys for all night dance parties, the VJ mixes live visuals to accompany DJ performances (Faulkner, 2006). In the 1990s, these visuals reflected the psychedelic imagery of electronic dance music culture, as seen elsewhere on record sleeves and rave flyers (Savage, 1996). Videos of VJ mixes from this period include *Dance in Cyberspace* (Dr. Devious and the Wiseman, 1992); *Global Chaos* (Hex, 1993); *Future Shock* (Frost et al., 1993); and the *X-Mix* series (Studio !K7, 1993–1998). Much as electronic dance music was facilitated in part by the democratisation of music production via low cost home studio equipment, sequencers, samplers, and synthesizers, VJ culture benefited from affordable video editing technologies like the NewTek Video Toaster and ray tracing packages that allowed 3D animations to be created on home computers. As I will discuss in Chapter 6, the technologies and visual aesthetics of VJ culture are in close proximity with the 'demo effects' (short real-time computer graphics demonstrations) produced in the 'demoscene' computer art subculture (Polgár, 2005), and in some cases music visualisers were also used by VJs[11].

Modern VJ culture is mostly computer-based. The VJs of today will typically use a laptop running software such as Resolume, VDMX, or Modul8, which allows live mixing of digital videos stored on hard disk drives. VJs can make their own video loops, rip them from any number of online sources, or purchase packs of pre-designed visuals online. Alternatively, they can use generative animations written in programming languages for visuals, such as Processing, Quartz Composer, or HLSL (High-Level Shader Language). Video can be mixed in real-time using MIDI controllers, but may also utilise audio amplitude or frequency analysis to generate oscilloscope patterns or automate certain visual effects. The typical function of the VJ remains the provision of live visuals to accompany DJs in nightclubs, however these practices now extend into a wider field of audio-visual performance and media arts, and the boundaries between these areas are not always clearly defined. In London this wider sphere of activity is represented by Splice Festival, which brings together various strands of audio-visual performance, visual music, VJ performance,

live coding, and performance art (Weinel, 2018e). Contemporary VJ work may also engage with video mapping technologies, using software such as Mad Mapper, which allows visuals to be projected across complex, irregularly-shaped stage sets at music festivals. Video mapping can also be used to create VJ performances in fulldomes[12], as was showcased at the Fulldome UK 2016 festival in Leicester, which included several psychedelic works (Weinel 2018d, pp.131–132).

Also of relevance to *Explosions in the Mind* are representations of ASCs that occur in video games. A growing number of games include sequences in which the player character may undergo states of intoxication, psychosis, or other forms of non-ordinary sensory experience. As seen in titles such as *Silent Hill* (Konami, 1999) and *F.E.A.R.* (Monolith, 2005) it has become fairly common for psychological horror games to include representations of auditory hallucinations, as a means to support the narrative of the game, character development, and instil a sense of unease in the player (Demarque and Lima, 2013). A more recent game that includes representations of auditory hallucinations is *Hellblade: Seanu's Sacrifice* (Ninja Theory, 2017), which used binaural recordings to give the impression of the protagonist hearing voices. This game received funding support from the Wellcome Trust, and these designs were informed by advice from mental health professionals. Other games incorporate sequences of intoxicated drug use, which are usually portrayed using various post-processing filters, DSP effects, and sonic atmospheres. For example, the neo-noir third-person shooter game *Max Payne* (Remedy Entertainment, 2001) featured scenes in which the protagonist is intoxicated, wandering through the morbid corridors of his mind; while in *Far Cry 3* (Ubisoft Montreal, 2012) the player character experiences various sensory distortions after consuming magic mushrooms. Other intoxicated game sequences are more whimsical or comical. *Grand Theft Auto V* (Rockstar North, 2013) features various humorous and 'edgy' representations of recreational drug use; while the 'Lightbearer' downloadable content for *We Happy Few* (Compulsion Games, 2018) delivers a narrative filled with sex, drugs, and rock n' roll escapades through colourful, surrealistic tongue-in-cheek portrayals of psychedelic pill-popping. Experiences like these are now being brought into VR, as seen in more meditative titles such as Jan Kounen's *Ayahuasca: Kosmik Journey* (2019; see also Haridy, 2019), which takes the viewer on a shamanic ayahuasca trip; or *Soundself: A Technodelic* (Andromeda Entertainment, 2020), a voice-activated VR experience in which the user must create "om" sounds that are transformed with DSP effects to embark on a voyage through waves of kaleidoscopic visuals.

Other music-oriented video games may also include visualisations of sound, which to varying degrees may be considered 'psychedelic'. The musical 'on-rails shooter'[13] *Rez* (United Game Artists, 2001) is an important game in this area, in which events are quantised and occur in synchronisation with the electronic dance music soundtrack. The game notes

inspiration from the visual music painter Kandinsky, and the updated VR version *Rez Infinite* (Monstars, 2017) uses colourful particle effects which develop in tandem with the music, enhancing the impression of synaesthesia. Other shoot 'em-up games that use various forms of psychedelic visual effects, audio reactivity, and rhythmic synchronisation include *Polynomial* (Lavrov, 2010), *Beat Hazard* (Cold Beam Games, 2010), and *Lost Future Omega* (Mebius, 2018). The 'rhythm game' is an expansive genre, in which players are challenged to match the beat of the music, and these may include audio-reactive backdrops or environments that relate to the music. The most popular current example of this in VR is *Beat Saber* (Beat Games, 2019). In *Beat Saber,* the player stands in a minimalist tunnel environment swiping at coloured blocks with lightsabers in time to the music. Other variations on the rhythm game formula situate the player as the pilot of a vehicle that must be precisely controlled in relation to musical timing, as seen in both *Audio Surf* (Fitterer, 2008) and *Thumper* (Drool, 2016), which has a VR version. There are also a number of music visualisations that do not have a ludic dimension, simply providing immersive audio-visual experiences of music that can be enjoyed in VR. For instance, *MelodyVR* (MelodyVR, 2019) uses video footage to allow the user to watch concerts in VR, while *Fantasynth* (HelloEnjoy, 2017) allows the user to fly through an illuminated environment that pulses in time to the soundtrack. Of course, there will always be many more works that one could mention in this section, but for our purposes this overview is sufficient and outlines the wider context for the projects discussed in *Explosions in the Mind.*

<1>**The Chapters**

Through the course of this book I will discuss the compositional methodologies used to realise various creative projects that represent ASCs and provide psychedelic sounds and visualisations. This work has been undertaken primarily as 'practice-led research' in an academic context. The works discussed in earlier chapters of the book were completed as part of my PhD in music at Keele University, while many of the other projects covered later on were undertaken as postdoctoral research elsewhere. For readers unfamiliar with this term, 'practice-led research' is based on the premise that the production of the creative works themselves constitutes a contribution to knowledge, leading to innovations that could not otherwise be obtained through alternative means (Smith and Dean, 2009). Practice feeds into the generation of theory, which in turn, informs practice[14]. This methodology is often appropriate for academic research in areas such as sound design and music composition, because it allows researchers to gain new insights by developing new tools or compositional strategies that expand the repertoire. Practice-led research is also sometimes used in industry, and may be combined with interdisciplinary approaches, for example, by using empirical

methods to test and evaluate outcomes (Weinel and Cunningham, 2021). Practice-led research is sometimes described as 'research through design', emphasising the potential for innovation through the process of designing and making new things in relation to specific objectives. For our purposes here, those 'new things' are electronic music and audio-visual compositions, which explore possible strategies for representing ASCs and psychedelic visualisations of sound. These projects approach this area from various angles, and the continuity between works represents a journey through this subject across different media technologies. Chapters group the compositions thematically, and with a few exceptions made to accommodate the logical grouping of works, the discussion is also chronological.

Chapter 2 begins by discussing fixed-media compositions of electroacoustic music composed between 2007 and 2011, which seek to represent ASCs. The initial works discussed in this chapter were composed by taking typical features of ASCs, such as visual patterns of hallucination, or distortions to time perception, and translating them into sound. Extending this idea, later works use the typical form of hallucinations to inform the structural organisation of materials, so that the composition as a whole becomes analogous to what one might see or hear in a psychedelic hallucination. The elaboration of this approach is explored through *Nausea* (2011), a long-form multi-channel composition, which exhibits several distinct musical movements.

Chapter 3 takes the discussion into the realm of real-time performances of electronic music. Several of my electroacoustic compositions were realised with a specially designed software tool: the Atomizer Live Patch, which facilitates the creation of sonic materials based on hallucinations, and can also be used for live performances. In this chapter, both the design of this tool and its use for a live performance in New York City are discussed. Following this, I also examine another piece of software: Bass Drum, Saxophone & Laptop, which provides a real-time performance system for live instrumentation and electronics, in which DSP is automated in order to suggest the shifting perceptual changes that one may experience during hallucinations.

Chapter 4 moves into the area of audio-visual composition. First, I discuss *Tiny Jungle* (2010), a fixed-media piece, in which various materials were designed based on the concept of visual patterns of hallucination. This piece was also created with a bespoke software tool, the Atomizer Visual. Following this, I discuss a trio of fixed-media visual music compositions: *Mezcal Animations* (2013), *Cenote Zaci* (2014), and *Cenote Sagrado* (2014), which drew inspiration from a trip to Mexico, and are based on different concepts of hallucination and synaesthesia. These works incorporate hand-painted materials using direct animation techniques, and explore the digital compositing of these materials with stop-motion animation and computer graphics.

Chapter 5 looks at ways in which to 'simulate' psychedelic hallucinations through interactive projects. An early experiment in this area, *Quake Delirium* (2010), is a computer game modification, which automates game parameters, graphics, and sounds in order to represent fluctuations in perception, such as one might experience during an episode of hallucination. Following this project, *Psych Dome* (2013) is an interactive artwork designed for presentation in a mobile fulldome, which uses original software patches to generate visual patterns and corresponding sounds based on Klüver's (1971) form constants. Through the use of a biofeedback electroencephalograph (EEG) headset, the piece provides a connection between the brain activity of the viewer, which is used to modulate the sounds and visualisation. Lastly, *ASC Sim* (2017) is a game-engine project that provides three prototype mechanisms to simulate auditory hallucinations.

Chapter 6 focuses on a discussion of my VJ performances from 2018 onwards under the alias Soundcat. Building on techniques described in the earlier chapters, these performances were realised through the construction of various hand-produced and computer generated materials, which were then mixed together in real-time, resulting in a series of original videos for existing music. In live performances these videos are then combined to provide a DJ/VJ mix. In this chapter, I will also discuss various paintings that were completed alongside this work, which interpret sound and music through abstract and symbolic forms. These works can be understood as 'sketches' or companion pieces, which develop related synaesthetic visual ideas. Three of these pieces form a series in which augmented reality is used to bring still elements to life as VJ loops.

Chapter 7 discusses *Cyberdream* (2019–2020), a VR project, which has been developed through distinct iterations for the Oculus Gear VR and Oculus Quest devices. This project extends many of the principles described in the earlier chapters, in order to provide a psychedelic visualisation of electronic music. The structure of the piece assumes the form of a DJ/VJ mix, where various scenes become analogous to music tracks, which the user moves through interactively. *Cyberdream* also provides a series of audio-visual 'sound toys', which allow the user to interact and creatively 'paint with sound', generating psychedelic visualisations of sound.

Chapter 8 considers the various projects that have been discussed throughout the book, summarising the conceptual approaches, theoretical insights, and practical strategies used. Consolidating these outcomes, *Explosions in the Mind* will present a set of three design frameworks for composing works that represent psychedelic hallucinations and ultimately provide psychedelic visualisations of sound. These frameworks will allow the reader to consider new opportunities and approaches that might be used in their own electronic music, audio-visual compositions, or interactive projects, which will undoubtedly push this field of research and creative-practice yet further into exciting, uncharted territories.

For each chapter of *Explosions in the Mind,* supplementary materials have been provided online (http://www.jonweinel.com/exp_media/downloads.htm), which will allow the reader to listen to, watch, or experiment with software tools related to many of the electronic music and audio-visual compositions discussed. It is recommended that the reader refer to these in order to gain a more complete understanding of the work. For instances where the composition cannot be provided (as in the case of live performances), demonstration recordings and videos have been provided instead.

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From shamanic rituals to modern electronic dance music festivals and psychedelic VR experiences, human culture is interwoven with ASCs. Within this broad area, *Explosions in the Mind* focuses in particular on the representation of psychedelic hallucinations, which I have used as a basis for the design of electronic music and audio-visual composition for more than a decade. This book provides a comprehensive documentation of these works, ultimately leading to new strategies for composing psychedelic visualisations of sound. The journey presented herein traverses multiple creative approaches in practice-led research, and these are entwined with advances in immersive technologies. By providing a detailed account of my own compositional practices in this area, it is my hope that others will be able to draw upon and extend this work, allowing us to make the most of the opportunities that new audio-visual technologies provide for immersing audiences into synaesthetic virtual worlds of sound and image.

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[1] Possession of 'magic mushrooms' and many of the other drugs mentioned in this chapter is illegal in most countries. Many of the ASCs discussed in this chapter are also potentially dangerous, and are not recommended to the reader. In contrast, psychedelic visualisations of sound are generally safe, although some may use stroboscopic visual elements that should be avoided by anyone with photosensitive epilepsy.

[2] Related topics are also explored in my book *Inner Sound: Altered States of Consciousness in Electronic Music and Audio-Visual Media* (Weinel 2018d). Whilst the focus of *Explosions in the Mind* is on my own practice-led research in electronic music and audio-visual composition, *Inner Sound* provides a wide-ranging analysis of existing works related to ASCs. For an expanded discussion of the wider area, readers may also wish to refer to *Inner Sound,* which is complementary, and could be read either before or after *Explosions in the Mind*.

[3] 'Psychonaut' is a colloquial term for a person who takes a particular interest in exploring the nethereaches of the human psyche through means of psychedelic drugs and other ASCs.

[4] Accounts of ASC experiences are available in various books, scientific studies and websites. For example, Hayes (2000) provides a collection of experience reports; Strassman (2001) documents participant studies with DMT; while the website erowid.org has a vast database of self-reports covering the effects of almost every known intoxicating plant or substance.

[5] Rouget's (1985) use of the term 'ecstasy' describes ASCs that occur in shamanic rituals characterised by quiet stillness, and should not be confused with those states produced by the euphoric stimulant MDMA, commonly known as 'ecstasy'.

[6] For a further discussion of auditory hallucinations, see also Weinel, Cunningham, and Griffiths (2014b).

[7] Schafer (1994, pp.148–150) discusses the associative properties of sound, which may give rise to psychoacoustic responses, semantics, and aesthetics. As Schafer acknowledges, these responses are not fixed, but may vary between individuals.

[8] 'Electroacoustic music' is a form of Western art music originating in the mid-twentieth century via work such as Pierre Schaeffer's 'musique concrète', and Karlheinz Stockhausen's 'elektronische musik' (Manning 2004). See also Chapter 2.

[9] 'Fulldome' is a type of immersive 360-degrees projection environment in which a video is projected across a dome-shaped ceiling.

[10] Throughout this book 'fixed-media' refers to musical and audio-visual compositions created in the studio, resulting in audio or video recordings that may be played back at concerts or festivals.

[11] For example, Jeff Minter's VLM were also used to provide the visuals for dance bands such as The Shamen, Primal Scream, and The Orb (Minter, 2005).

[12] United VJs are a group who have been particularly active in this area, having created their own Blendy Dome VJ software. They have provided various international workshops on fulldome VJ performance (which the author has been fortunate to attend), and were behind the video mapping at various high-profile events such as the Rio 2016 Summer Olympics.

[13] An 'on-rails shooter' is a type of video game in which the player must shoot at targets while moving along a predetermined animation path.

[14] The integration of theory and practice in the arts is sometimes referred to as 'praxis'. For a further discussion see also Liggett (2020).