The Workshop as Art: Insight Into the Subjective Experience of Perceptual Illusion Through an Expanded Art Practice

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DECLARATION

I declare that the work presented in this thesis is my own. No part of the material referred to in this thesis has been submitted in support of an application for any other degree or qualification at this or any other university or institution of learning.

Antony Hall

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Abstract

This thesis documents and analyses the development of a series of artistic workshops based on re-creations of scientific experiments which explore the subjective experiences of perceptual illusions. It explains how reflections on expanded art practice led to a re-positioning of the workshop as art, in effect re-framing the scientific experiments performed within the workshop as part of a co-creative artistic experience. I argue that this shift in perspective had transformative effects on the experience of the workshop (for both practitioner and participant), which renders a utility and significance for the workshop beyond educational research or as an engagement tool.

This investigation uses a mixed-methods approach, which combines artistic research with experimental psychology. The workshops were based on multisensory perceptual illusions, which employ combinations of tactile, sonic, and visual stimulation. Specifically, three experimental models were used: the 'rubber hand', 'Ganzfeld', and 'strange face' illusions which are studied widely in experimental psychology. A key challenge of this research was to capture the subjective experiences of subtle sensory phenomena that exist at the limit of perception. In light of this, a theoretical framework encompassing practical aspects of mindful practice to enhance self-awareness is developed. This thesis provides an in-depth exploration of participants subjective perceptual experiences and shows how they informed the development of three new limited-edition workshops.

The thesis articulates emergent findings and benefits that are of value to both scientists and artists. These include reflections on the performative roles of participants within the workshop (which led to a re-positioning of the 'workshop as art'), and new experiments that raise important questions relating to the role of imagination and sensory suggestibility in perceptual illusion. The documentation of the workshops and the resources (instructions and scores) required to re-create them, are presented as an online exhibition supporting this thesis. The research provides new knowledge and a much needed transferable framework of practice for artists and researchers working in the field of science art collaboration, transdisciplinary practice.

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Preface

This thesis was written under the shadow of the coronavirus pandemic and the wave of Black Lives Matter protests. Each of these has had a subtle effect on the direction of the research in its latter stages. In addition to the disruption caused by social distancing requirements, I reflected on my own mixed-race cultural heritage and the effect these factors have had (in addition to dyslexia) on my education and my career choices. I believe they have informed a tendency towards interdisciplinary thinking that has enabled me to forge my own pathways and follow an interest in science through my artistic practice. As a dyslexic, I have also realised through this research that my writing is entwined with a visual thinking process that becomes manifest experientially through practice and vice versa. Ideas manifest as mental images, sketches, and drawings that inform an internal model of the research as a whole; these are then tested as experiments and workshops. Each drawing placed in this thesis represents the tip of an iceberg of many recurring prototypes. They not only aid to illustrate the ideas discussed through the writing — they are integral to it. Similarly, my blog works as an extension of the research process; a reflective journal, a repository for sketches and notes, and a home for sharing ideas and works in progress. The online PhD exhibition was installed and self-curated as a live process through the blog in parallel with the drafting the final thesis and should be understood as integral to it. The exhibition can be accessed via the link provided in Section 1.2.

1. Introduction

This thesis describes and analyses a period of artistic research that resulted in a series of workshops based on recreations of scientific experiments. I articulate how this process enabled critical reflections on the practice and emergent findings that led to a re-positioning of the workshop as art. In order to frame the workshop as art, a method was developed which encompassed instructional scores, a process of editioning and issuing certificates of participation, in addition to documentation of the event**.** I argue this re-positioning (of the workshop as art) had transformative effects on the experience of the workshop (for both practitioner and participant), re-framing scientific experiments, performed within workshop, as artworks. This research shows how employing this approach had benefits in terms of the quality of the data collected and the in-depth exploration of the subjective perceptual experiences of those involved. These benefits are evidenced through emergent outcomes, including ideas for new experiments that are of interest to both art and science. This section will summarise the research journey, its motivation, context, and key methods, before finally outlining research questions and contribution to knowledge.

Much of my practice in the past, in addition to exhibiting, has been concerned with the production and delivery of workshops. The workshops centred around my practice, taking place in art contexts[1] and were themed around science, or my collaborations with scientists. While the most rewarding workshops sparked new ideas, enabled learning and built networks, others felt like an empty gap in the practice, leaving no space for reflection or action on the outcomes. A personal motivation for this research was to become more productive as an artist and to rejuvenate and enliven the practice, by making better use of workshops, not just as background activities and research mechanisms, but as significant events and experiences that could be placed at the forefront of the practice. Through this research, operating within an academic context, I was afforded space to reflect upon and develop this undercurrent of the practice and to perform an in-depth exploration of the critical role workshops take as creative drivers and outputs of the practice.

[1] Such as art schools, art galleries, with artists and artists groups or the general public.

This research is primarily informed by collaborative work[2] with experimental psychologist Dr Ellen Poliakoff[3] concerning perceptual illusion. Experimental psychology is defined as "[the]…scientific study of behaviour, motives, or cognition in a laboratory or other controlled setting in order to predict, explain, or influence behaviour or other psychological phenomena" (APA, 2020). Experimental psychologists work closely with participants and collect quantitative data (such as physiological measures[4]) in conjunction with qualitative data obtained through questionnaires and interviews. Perceptual illusions, sometimes referred to as sensory illusions[5], are cognitive phenomena that occur in the way the brain processes the sensory information it receives.

The workshops which directly informed this research were based on three specific models used in experimental psychology: the 'rubber hand illusion' (RHI), 'Ganzfeld', and the 'strange face illusion' — each of which (described in greater detail in Chapter 5) combine elements of tactile, sonic, and visual stimulation. These necessarily subjective and unusual illusory experiences are notoriously difficult to measure, as they can be difficult to explain and sometimes hard to perceive. Indeed, for some participants, nothing happens at all. Perceptual illusions are unstable, coming and going, shimmering just on the edge of the sensorial field. Therefore, in addition to scientific methods, which involved detailed (qualitative and quantitative) analysis of participant experiences, the workshops also made use of artistic methods (drawing, perception enhancing warmups and initiations[6]) in order to create spaces for reflection on the experience of perceptual illusions.

The key method employed through this research is 'the artistic practice'; specifically, my own practice as developed over 20 years. This practice is situated between art and science, and is always interdisciplinary and collaborative, expanded across many mediums. My process begins with the re-creation of experiments, extracted from books[7] and scientific research

[2] For more detail, see Section 1.5 and 1.5.1.
[3] Dr Poliakoff is co-director of Body Eyes and Movement Lab (BEAM Lab) at the University of Manchester (see Section 1.5.1).
[4] Such as heart rate, galvanic skin response (GSR) and electroencephalogram (the electrical activity of the brain).
[5] Tactile, auditory, olfactory, taste, and somatosensory.
[6] See Section 3.4.
[7] An important point of reference for the original Tabletop Experiments project was a series of books called 'Recreative Science: A Record and Remembrance of Intellectual Observation 1860'. The book contains articles by amateur scientists that were "focused on aspects of natural history and other branches of science that readers could try for themselves at home or

papers, which will form a point of departure for a work or series of works[8]. Experiments are re-created through the practice in the format of 'tabletop experiments', which use low-tech equipment and domestic materials and explore aspects of natural phenomena such as the physical behaviour of liquid and animal physiology, or as is the case with this research, sensations of human perception. As stated in the Manifesto of Tabletop Experiments[9], these are usually precariously balanced systems existing on the edge of functionality and sometimes on the cusp of perception. The work often employs systems of feedback that aim to perpetuate the phenomena and extend its existence for observation. These processes, re-framed through the practice, are open to the intervention of chance elements, those who participate, and the conditions of the wider environment; they are often liable to fail. Therefore, the work needs to be sustained through my intervention and often takes the form of workshops or performances (see Appendix 13: Manifesto of Tabletop Experiments). The practice seeks to instigate these encounters and is dependent upon them to enrich and sustain itself.

in their local area" (Shuttleworth, 2014:online). The book contained detailed musings on such things as the microfauna growing in the interior of a mouldy nut, the construction of a homemade telescope, and pond life. This series can be considered a predecessor to Scientific American, which originally published articles by amateurs and professionals, often with advanced instructional materials for DIY projects.

[8] The 'Observers Book of Pond Life' (Clegg, 1967), for example, inspired 'Pond Life' Gallery39 Cardiff 2001, an interconnected system of projectors and micro aquariums, a version of which was revisited as a workshop in 2009 at Manchester Art Gallery and later at Manchester Library 2017. The book 'Experiments with Soap Bubbles' by C. V. Boys (Boys, 1986) formed the basis for an exhibition and residency (Gallery39, 2001) (Figure 1). These books also inspired science art workshops delivered in schools across the country between 2001-2018.

[9] See Tabletop Experiments (Appendix 13).

Figure 1: Experiments with Soap Bubbles, Castlefield Gallery 2005.

I think of my practice as a symbiotic organism moving between its various host environments; different fields of specialisation (art or science), and environments of practice (the lab or studio). A dendritic ameboid-like vessel, permeable and continually changing shape, adapting, searching, and generating explorative feelers, collecting ideas through osmosis, processing and reprocessing these materials. The practice supports itself by emulating the behavioural elements of its host, re-creating and learning its processes and assimilating these materials, adopting these new languages and methods. As will be explained through the thesis, this nourishment can be understood in terms of 'objects' of research: specifically, boundary objects[10] that manifest on the overlap between collaborating spheres.

[10] Boundary objects enable collaborative processes by forming anchor points, highlighting differences in perspective, or enabling connections to be made. The boundary object concept is used widely in discussions around interdisciplinary design processes and has been shown to be useful to collaborative design processes (Välknolwenn and Mougenot, 2019).

Visualising the practice in this way has been influenced by Deleuze and Guattari's *notions* of the rhizome — an exploratory interconnecting network with the ability to emerge throughout several different strata. In relation to this, Simon O'Sullivan develops a more specific idea of 'expanded practice' (O'Sullivan, 2005:170), which is a highly-interdisciplinary, collaborative, connection making, and rhizomic in structure. "An art practice is always a work in progress, the building of an assemblage whose dimension changes as its composition alters — whose outline shifts and shimmers as it moves between milieus". O'Sullivan also suggests that such a practice should build "probe-heads" (another Deleuzian concept) which he describes as a kind of "experimental device aimed at dismantling the strata that binds us and constitutes us as 'human'" (O'sullivan, 2004:online).

O'Sullivan's concept of the expanded practice resonates strongly with my thoughts on how collaboration is integral to my practice. Interactions with peers (scientists and artists), and the public, result in new ideas, which are transposed into the practice and developed in the studio, and then made manifest through artworks and workshops. In this way, the work is co-created through the experiences of those who participate in an expanded process through workshops and discussions about the work. Even the smallest feedback can have significant effects on the work. To reach deeper into this process of collaboration and co-creation and its function within the practice, I develop the notion of interface object[11]. Interface Objects are simulacra of the practice, a workshop for example, which serve a rhizomatic or 'probe-head' like function. As vehicles of research, they seek and interrogate; in doing so, they generate questions. Interface objects do not only replicate and proliferate in the rhizomatic sense, but they can also move between sites and feedback into practice. In this sense, interface objects are more mycelial in behaviour. Under the right conditions, fruiting bodies generate as outputs of the practice — prototypical entities that emerge from collaboration.

[11] Detailed in Section 3.3 and 6.3.

1.1 Research Questions and Contribution to Knowledge

A challenge from an artistic perspective is to set solid and convincing research aims while leaving these open enough to allow for exploration and open-ended enquiry. However, it was necessary within an academic framework to define clear and realistic research aims and objectives. These evolved over the course of the project but remained similar in their essence. This research has been driven by the following questions: In what ways can an expanded arts practice contribute to an understanding the subjective experiences of perceptual illusion? How then, in turn, would these insights inform the practice and generate questions of interest to science? As this thesis will show, this was not a straightforward route of inquiry. The objectives in the original research proposal stated that a new body of work would be created based on the outcomes of the workshops.

The process of adopting new methods into the practice, repurposing scientific experiments and reflecting deeply on my practice had transformative effects. This led to a shift in the focus of the research, placing the workshops as art, at the forefront of the study. Within the frame of the 'workshop as art', the data, questionnaires and the process of their analysis — are also exploited as creative methods, as 'expanded documentation'[12] of the workshop which both informs and evidences the practice. The online exhibition 'The Workshop as Art' presented in support of this thesis, consists of documentation, instructions and scores, and demonstrates how these methods worked in practice (see Section 1.2).

In repurposing scientific experiments as art through the workshop, participants are given an experience of science as a co-creative, open-ended process, meaning participants feel less like guinea pigs[13] subject to a research study. Instead attention is drawn to the value of their subjective experience as something that contributes to the work. Conversely, employing aspects of scientific experimental practice within the workshop engages those less comfortable with creative aspects of art practice[14]. This complex interrelationship between

[12] A term developed further in Section 5.5.
[13] Discussed in Section 6.1.
[14] Specific examples of this can be found in Section 5.1.2

participant and practitioner, within the workshop environment form an 'interface object', changing and adapting with its participants.

As discussed in Section 1.3, research has shown many benefits for scientists who participate in transdisciplinary science art collaboration projects. Specifically, it is helpful for scientists to see their work re-framed beyond the laboratory and participate in speculative open-ended projects[15]. These benefits are evidenced through this research, in the unique insights into perceptual illusion, new ideas for experiments and avenues for future research (scientific and artistic). Many of these emergent outcomes may not have been possible working in an entirely scientific context (as discussed in Section 9.2). In terms of the artistic research specifically**,** the research provides useful tools, practical examples and methods, which contribute to current critical debates around interdisciplinary practice and science art collaboration (see Section 9.1). This thesis, and the work created through it aim to convey a spirit of exploration and experimentation and to inspire artists and researchers working through workshops, with science, or in science art collaboration; it is written with the intent of inspiring those interested in delving deeper into the experiences of individuals who take part in such work.

The remainder of this chapter gives information on how to access the exhibition (Section 1.2), and further unpacks the context and position of this research in relation to science art collaboration (Section 1.3). It also provides background information on the science of perceptual illusions (Section 1.4), and specifics of the collaboration and previous workshops informing this research (discussed in Section 1.5). This chapter finishes with a summary and outline of the thesis structure (Section 1.6).

[15] This is expanded upon in Section 1.3 Science art Collaboration.

1.2 PhD Exhibition:

The online exhibition takes the form of several web pages interlinked by an interactive image that works as an exhibition guide.

> **Online Exhibition Instructions:**
> To explore the exhibition on the website, roll over the gallery plan and click on the links; this will take you through a series of blog pages that form the exhibition. Each page contains this same gallery plan. If you get lost in the blog, you can return to the exhibition via the 'PHD EXHIBITION' link in the main menu at the top of the page.
>
> **http://antonyhall.net/blog/PHD-exhibition**
>
> Appendix 1-12 is referred to throughout this thesis contains further information and web links to each individual work. It can be used as an offline reflection of the online exhibition.

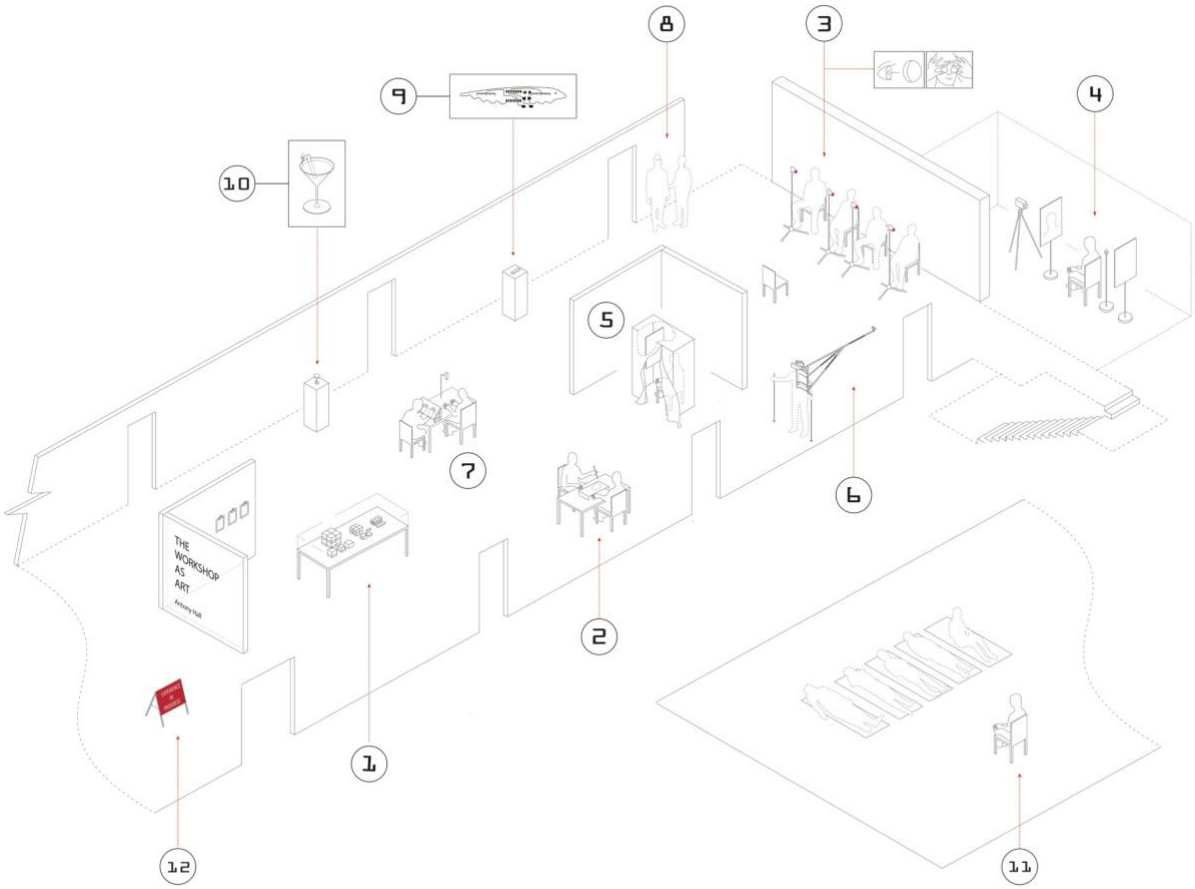


Figure 2: PhD exhibition plan.

List of workshops (numbers correspond to appendix sections):

1. **Workshop Editions** http://antonyhall.net/blog/phd-workshop-editions/
2. **Unfeasible Object** http://antonyhall.net/blog/unfeasible-object/
3. **Perception Without Object** http://antonyhall.net/blog/object-without-perception/
4. **You Are the Object of Your Own Observation** http://antonyhall.net/blog/yatooyoo/
5. **Mirror Gaze box** http://antonyhall.net/blog/mirror-gaze-box-2/
6. **Autoscope** http://antonyhall.net/blog/autoscope/
7. **Action Intention Paradox** http://antonyhall.net/blog/action-intention-paradox/
8. **Navigation and Central Field** http://antonyhall.net/blog/navigations-2/
9. **Fish-Brain-Machine** http://antonyhall.net/blog/enki-pcb/
10. **Electronic Taste Perception** http://antonyhall.net/blog/taste-perception-experiments/
11. **On the Inwardly Generated Image** http://antonyhall.net/blog/on-the-inwardly-generated-image/
12. **Experience in Progress badge** http://antonyhall.net/blog/experience-in-progress/

1.3 Science Art Collaboration

Despite being consistently referred to a new phenomenon over the past two decades, steady and growing interest in the area, and the tendency for artists to work with science is nothing particularly new. In the late 1960s, many of the most influential artists started formally collaborating with scientists and engineers and began working with new technologies as their creative medium, with the legendary '9 Evenings' and 'Experiments in Art and Technology' (E.A.T, 1967)[16] being the epicentre of the movement. At this time, there was also a gradual move towards participation and interaction in the arts. Dorothea von Hantelmann describes this as an 'experiential turn' (Hantelmann, 2014:1) in which many artists shifted their focus away from tangible objects and images and towards the viewers' perceptions and subjective experiences[17]. Artists began creating environments, happenings, and installations which positioned the viewer as a participant within the work, which led the viewer to reflect on their interactions within the work[18] (Bishop, 2010:11). Artists started working with pure light and reflective surfaces, making wearable devices which disrupted the gaze, expanded or augmented the senses[19]. These artists aimed to highlight our symbiotic relationship with science and technology as an omnipresent force — a theme of enquiry which remains as significant today as it was in its beginning stages.

In the UK, the more contemporary phenomenon of 'SciArt' (a term whose origins date back to the early 1970s[20]) emerged in the mid-1990s when the Wellcome Trust began using the term to significant effect, promoting their specific brand of science art collaboration. Science art collaboration is still most commonly understood in this way: a pairing of an artist with a scientist who work together towards a collaborative outcome, often with an aim to communicate issues of science through the arts. The Wellcome Trust's own in-depth review of the SciArt Programme (Glinkowski and Bamford, 2009) showed that the projects had

[17] Robert Morris, Donald Judd, etc.
[18] Lygia Clarke, Eyeglasses, 1968, Walter Pichler, TV Helmet, and, later, Alfons Schilling, Vision Machines 1973.
[19] Increasing public engagement and understanding of science was the underlying motivation of the SciArt project.

[20] "Artists involved with *9 Evenings: Theatre and Engineering* include: John Cage, Lucinda Childs, Öyvind Fahlström, Alex Hay, Deborah Hay, Steve Paxton, Yvonne Rainer, Robert Rauschenberg, David Tudor and Robert Whitman. Notable engineers involved include: Bela Julesz, Billy Klüver, Max Mathews, John Pierce, Manfred Schroeder and Fred Waldhauer" (Arts Catalyst, 2019).
[20] The term was first coined by Bern Porter (Porter, 1971) a member of the 'Experiments in Art and Technology' group.

enabled scientists to see their work in a new way and allowed them to explore their work's more creative aspects and potentialities; crucially, it helped them to communicate their works more clearly to the public (Glinkowski and Bamford, 2009). At this time, such collaborations were often framed as bridging a gap between the arts and sciences or questioning the relationship between them. However, the artists involved rarely saw their work in this way (Glinkowski and Bamford, 2009:28). Charlotte Sleigh and Sarah Craske's critical reflection on the history of science and art collaboration in the UK (Sleigh and Craske, 2017) summarises how early this discourse around 'SciArt' collaborations was often framed in terms of science communication, and that the success of the work was often qualified in terms of public engagement and its value to science in those terms (Sleigh and Craske, 2017:315). The insinuation was that the art was secondary to the science content, and that art (and its creators) was being used as a medium to communicate or engage new audiences with scientific issues.

I have worked on a number of science art collaborations which aimed to communicate ideas of science through my work and to engage new audiences with science and scientific ideas (outlined further in Section 1.5). I see this as a positive and useful outcome of collaborative work; however, as my practice has matured over the years, I no longer see this as the work's primary purpose. In the last decade, discourses around science collaboration have moved towards the idea of science art collaboration as 'trans-discipline' rather than a "relationship of complementarity" (Sleigh and Craske, 2017:317). Sleigh and Craske further identify a lack of critical dialogue around the artworks produced (Sleigh and Craske, 2017:226). Philip Ball similarly suggests a need to take a 'critical perspective' to evidence the value of science art collaboration (Ball, 2018:144). BioArt is a more critical field of SciArt, often framed around bioethical questions. Because of this BioArt often occurs outside of the academic context (Vaage, 2016), and sometimes requires bringing live process and laboratory equipment into the gallery (Jagodzinski, 2020). In 2005 I participated in the 'BioArt Workshop' (Arts Catalyst, 2005) which aimed to educate artists on the basic tools and DIY techniques for working with biotechnology. This workshop inspired my early work with perceptual experiences and living systems (Section 1.5).

It appears that the field of science art collaboration is developing so rapidly that there are no recognised critical frameworks or models of practice to follow (MacDonald et al., 2013:2). This has been a motivational factor in developing my own framework of practice — a methodology based on my own experience of collaboration (see Section 3.3). The fusion of art and science can lead to a blurring of boundaries with transformative outputs that can transgress boundaries and yield useful outcomes for both science and art. Roger Melena defined a typology of science and art collaboration, of which 'Type 1' is most significant to this research, as a 'transformative practice' in which scientists and artists collaborate on "common projects resulting in both scientific discoveries as well as the production of artworks". He continues to define several success metrics: the production of "scientific publications with artists as co-authors" and "art productions with scientists as co-authors" (Malina, 2011:online). As I alluded to earlier, I see the process of collaboration as a valuable 'product' of the research. Furthermore the 'products' of collaboration created through the practice often embody the process of their development, as exemplified in the workshops produced through this research.

In science, there is a growing interest in interdisciplinary collaboration (Scoones, 2017:online; Okamura, 2019; Valeriy et al. 2019). It is now recognised that the most urgent issues of our time, such as climate change and species decline, "cannot be addressed adequately from the perspective of any single discipline" (Bruin, et al. 2019). The rising interest in science art collaboration reflects this general zeitgeist (Jeffreys, 2018:online). This is reflected in the curatorial programmes of organisations known for their interest in contemporary science art practice, e.g. Arts Catalyst[21] and Invisible Dust[22] . Looking over these projects, it is clear that the projects are not framed as science communication[23], nor do they attempt to identify similarities between the 'two cultures'[24]. Contemporary science art collaborations are more commonly framed as interdisciplinary research, and aim to both raise awareness and create a critical dialogue around scientific issues.

[21]Arts Catalyst https://www.artscatalyst.org/projects [Accessed on 12th April 2021].
[22] Invisible Dust https://invisibledust.com [Accessed on 12th April 2021].
[23] However, I believe this to be a positive side effect of science art collaboration.
[24] A reference to the 'Two Cultures' lecture (Snow, 1959) which was often cited in relation to science art collaboration.

Claudia Schnugg writing of the value that science art collaboration can bring to organisations, notes that many artists and scientists see collaboration as a space for "exploration and experiments that is not bound to other organizational restrictions" (Schnugg, 2018:55); and that in order to make the best of such valuable liminal spaces: it is vital to provide time and space for open-ended enquiry. Schnugg also points out that art-science collaboration "builds on a growing number of experimental approaches. Therefore, many projects and programs are still set up in a very experimental way, outside of organisational structures and with very limited resources" (Schnugg, 2018:9).

Drawing from my own experience of collaboration with scientists and craftspeople, I find that it is the conversations and interactions, and the process, rather than the end product, that are of the most value[25]. I agree with David Edwards' vision of interdisciplinary collaboration, as an 'artscience' laboratory: a transdisciplinary space which dissolves boundaries between fields of specialisation in which "process matters more than results" (Edwards, 2009:178). The collaboration which provides the foundation for this research, is similarly a process — a conversation which began in 2011 and continued across a number of meetings and workshops (detailed further in Section 1.5.1).

1.4 Perceptual Illusion: Re-creation and Recreation

Perceptual illusions are phenomenologically different to optical illusions. An optical illusion can be described as "the perception of something objectively existing in such a way as to cause misinterpretation of its actual nature" (Patel, 2013:online). The illusion is contained within the image, e.g. the 'Duck Rabbit' illusion for example[26]. However, a perceptual illusion is a cognitive phenomenon; the illusion occurs as the brain processes the visual information. These can be multisensory illusions and can result from over-stimulation, sensory deprivation, or using mismatching stimuli, which work together to generate the illusory phenomena.

[25] For example, Owl Project (Owl Project, 2021) was a long-term collaborative project that I was involved with. We collaborated with crafts people: green wood workers, primitive technologists, and analogue synth enthusiasts for example. Owl Project spent time in those environments with the crafts people, making things collaboratively. Through this, a transferal of learning took place, and those methods were assimilated into the practice. The resultant work exists between the two fields of specialism.

[26] However, it could also be argued that these illusions are informed beliefs and previous experiences.

This research builds on three experimental models: the 'rubber hand illusion' (RHI), 'Ganzfeld', and the 'strange face illusion', each of which combines elements of tactile, sonic, and visual stimulation (each of which is discussed in greater detail in Section 5). In addition to the ever-widening pool of scientific literature growing around these experimental models, each has entered into the popular press at various times with numerous articles citing these as a means to hallucinate 'drug free'. Other examples of popular perceptual illusions that went viral are the 'blue-gold dress' (Fishwick, 2015:online) and the 'yanny vs laurel' auditory illusion (Guardian News, 2017). Indeed, these illusory experiences generate imagery and sensations that seem to emerge as if from nowhere and fit the definition of hallucination; seeing that which is not there. However, these are more accurately described as forms of perceptual illusion, or multisensory illusion.

It is important here to define the differences between illusion and hallucination; while an illusion is a misperception of existing stimuli, a hallucination is the false perception of something that does not exist. Hallucinations are considered to be rare occurrences, abnormal or even unhealthy, and can sometimes carry negative connotations of poor mental health or drugs use (Marcia,2021:online). In contrast, illusion is considered to be a misperception — a temporary distortion of the senses. Illusions are thought of as measurable and common in the healthy population, and thus a 'normal' phenomenon. While some of the visual experiences described through the various experiments can be considered as hallucinations (seeing that which is not there), scientifically speaking these should be categorised as illusion.

1.4.1 Perceptual Deprivation

Accounts of vivid hallucinatory experiences occurring as a result of looking into nothingness for extended periods of time are well documented. For example, prolonged exposure to total darkness can result in visual hallucinations (Merabet et al., 2004) the perception of lights and patterns that are sometimes described as prisoner cinema or phosphenes, light observed within the eye itself (Oster, 1970). The use of dark temple-like spaces (psychomanteums) as a means to receive wisdom or communicate with the spirit world reach far back into antiquity. Evidence suggests that in such spaces divinatory mirrors may have been created using

ceremonial bowls of liquid, or polished stone, where dark, possibly imperfect surfaces may have afforded the user opportunities to make mystic reinterpretations of the reflected image (Wehrstein, 2017:8). The magician and astrologer John Dee is known to have used a ‘black spirit mirror’ for his research into the occult (Simon, 2015:online). The effect of staring into a mirror and near dark conditions are explored in depth in Section 5.3, ‘The mirror gaze experiment’.

Featureless, unstructured fields of light are also known for their ability to induce hallucinatory effects. It was the monk Purkinje who made the first studies of the subjective visual experience of looking into nothingness, describing in depth, strange visual phenomena that seemed to be occurring within the eyeball itself (Wade et al., 2001:39). Polar explorers report similar visual experiences as well as altered mind states when traveling through featureless white landscapes. The renowned Artic explorer Ernest Shackleton reported the presence of a "fourth man" guiding his group (Grann, 2018:online). A well-known experimental model for the study of sensory deprivation is the Ganzfeld. The term 'Ganzfeld' (from the German for ‘complete’ or ‘whole field’) was introduced in the 1930s by psychologist Wolfgang Metzger in relation to Gestalt theory, Metzger describes methods such as staring at perfectly smooth walls and large sheets of paper, and noted changes in neural activity amounting to an altered state of consciousness (Metzger, 1930). The use of translucent hemispheres placed directly over the eye was first pioneered in 1953 (Hoghberg, 1953:154) and is now routinely used in laboratory studies (often with the addition of sound such as white noise) to create a homogenous auditory field. The most significant experimental studies of perceptual deprivation were made by experimental psychologist James Gibson who used specially-constructed rooms with hemispherical surfaces (Gibson, 1979). To this day, the Ganzfeld is widely regarded as a safe and stable means of inducing an altered state of consciousness (Schmidt and Prein, 2019) and is known for its ability to create a "sensory hunger conducive to the flow of spontaneous creative ideation and imagery" (Cardeña and Winkelman 2011:366). Many artists have made use of the Ganzfeld effect such as Olafur Eliasson's 'Your Blind Passenger' (Eliasson, 2010), a tunnel filled with fog and monochrome light, and Kurt Hentschlager's 'Zee' (Hentschlager 2008), an immersive environment using artificial fog and stroboscopic light. James Tyrell’s 'Light Reignfall' (Tyrell, 2011) takes the form of an hemispherical space which clearly resembles Gibson’s hemispherical perceptual cells. The

Ganzfeld method has been used extensively in this research and is discussed in detail in Section 5.2.

1.4.2 Multisensory Perceptual Illusion

As mentioned, the workshops developed for this research are based on original scientific experiments in perceptual illusion. Each of these experimental models represents a wide and specialised pool of knowledge, any facet of which could warrant a PhD project. This artistic investigation merely touches the surface of each (see Chapter 5) and aims to convey new knowledge that is generated from this exploratory process. Experiments have been re-created and reperformed within an artistic context, and are thus re-framed artworks. Each work in its own way, exploits a number of sensorial vulnerabilities; and in doing so, the works build toolkits for their continued exploration.

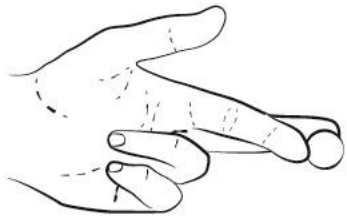


Figure 3: Aristotle Illusion.

> "Cross your fingers and touch a small spherical object, like a frozen pea or a marble, with the inside part of your crossed fingers. The effect is more salient if you close your eyes." (Baysan and Macpherson, 2017:online).

Multisensory perceptual illusions use a combination of sensory stimuli, sonic, tactile and visual elements to generate an illusory sensation. It was Aristotle who made the first description of a 'multisensory perceptual illusion' (See Figure 3). What might be discovered is the sensation of touching two objects. Conversely, one might sense not two objects but a strange sensation that is difficult to articulate. The Rubber hand illusion (RHI) (Botvinick and Cohen, 1998) is widely studied within the field of experimental psychology and remains a solid foundation for the study of issues around embodiment. In the experiment participants sit at a table and are asked to look at a rubber hand placed in front of them; at the same time, they

are instructed to place their own hand behind the partition next to it (or under a platform). The experimenter, sitting opposite, then proceeds to stroke and tap the replica hand in synchronisation with the hidden real hand. This synchronous combination of visual and tactile stimulation is enough to convince many participants that the rubber hand is their own. Often, a knife or hammer is brought down upon the rubber hand, at which point many participants withdraw their real hand in response — and even, in some cases, feel pain (Rohde et al., 2018). Over the last decade, the RHI paradigm has generated a rich body of research and has led to newly-discovered illusory phenomena which reveal the vulnerabilities in our perceptual system and allow us to question the nature of our perceived realities (this experiment is explored in detail in Section 5.1). This same model of visual and tactile stimulation can be used to simulate an out-of-body experience. The experiment was first reported by Henrik Ehrsson in 2007 (Ehrsson, 2007). Ehrsson created a scenario in which participants could see themselves from behind through the HMD. A mannequin under the camera is used in a similar way to the rubber hand in the RHI and is prodded in conjunction with the real body. This synchronous visual and tactile (Visio-tactile) stimulation leads to the sensation of existing in space outside the body. This experiment led to further discoveries such as the 'invisible body' and 'invisible hand illusion' (Ehrsson et al., 2013) and the 'body swap illusion' (Ehrsson, Valeria I., 2008). This technique has been used to great effect by scientists, artists and creative technologists who have exploited the creative and therapeutic possibilities these new techniques afford in terms of immersive technologies[27]. Be Another Lab describe themselves as an "anti-disciplinary collective dedicated to investigating the relationship between identity and empathy" (Be Another Lab, 2018:online). The group has built on the mechanism of the body swap illusion to explore a wide range of issues, including gender and disability. Be Another Lab uses a model of co-creation, sharing and enriching their research through workshops with the both the general public and focus groups. In doing so, they demonstrate the potential of exploring experiences of perceptual illusion through workshop-like formats that extend beyond the lab.

[27] See my own experiments using this method, Autoscope (Appendix 6)

1.5 Previous Workshops Using Perceptual Illusion

This research builds on a persistent undercurrent of inquiry into anomalous perceptual experience, initiated with Enki (Hall, 2006-2013), a project which was developed through workshops and gallery installations. The work was based around the Black ghost knifefish, an electrogenic species that uses electrical signals to see its environment and to communicate with other fish. The project used these electrical signals to interact with the fish and control an immersive audio-visual experience. The later iterations of the work developed into a complex interconnected system between the human and the fish. The work is a collage of multiple methods, including experimental and behavioural psychology, neurology, and even parapsychology, that investigates the neurological effects of sound and biofeedback (GSR and brainwaves). The installed work commissioned for by Arts Catalyst for 'Interspecies' (Arts Catalyst, 2009) took the form of a conditioning chamber[28] with two compartments, one for the human and one for the fish (see Figures 4 and 5). The installation was distinctly functionalist in appearance, one reviewer described it as an "anti-aesthetic...a vast assemblage consisting of soundproof chambers, psycho-acoustic audio devices, and a complex system of bio-interfacing…" (Kujawski, 2018:8). While another reviewer referred to "a makeshift booth", in which a communication experiment was conducted "between various members of the public and a Black ghost knifefish, an electrogenic fish species. Inside the booth, fish and human participant influenced each other with sonic and magnetic signals, the results of which were transmitted to display equipment in the gallery space" (Clapham, 2009). Outside the booth, there was a table and chair from which the work could be operated. The Enki project took the form of both workshops in which I was present and as a gallery installation where a gallery assistant took my place. When I was not with the work, a basic questionnaire was used to capture participant feedback[29].

[28] The conditioning chamber is a device used to study the behaviour of animals in the laboratory.

[29] Despite this being a comparatively well-resourced project, much of the time was spent in production, simply making it work and refining the technological aspects. There was little time for reflection and no time to act on the data collected. This research further developed this data collection aspect of the work; see Section 4.5.

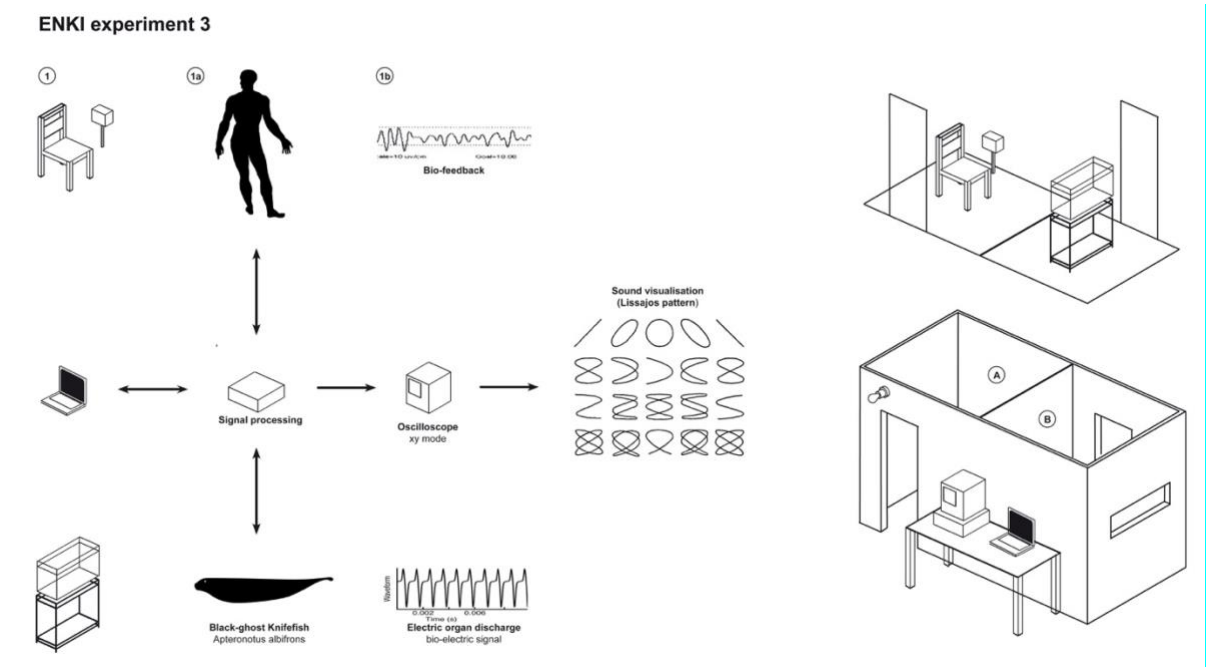


Figure 4: Enki, Experiment 3, 2009.

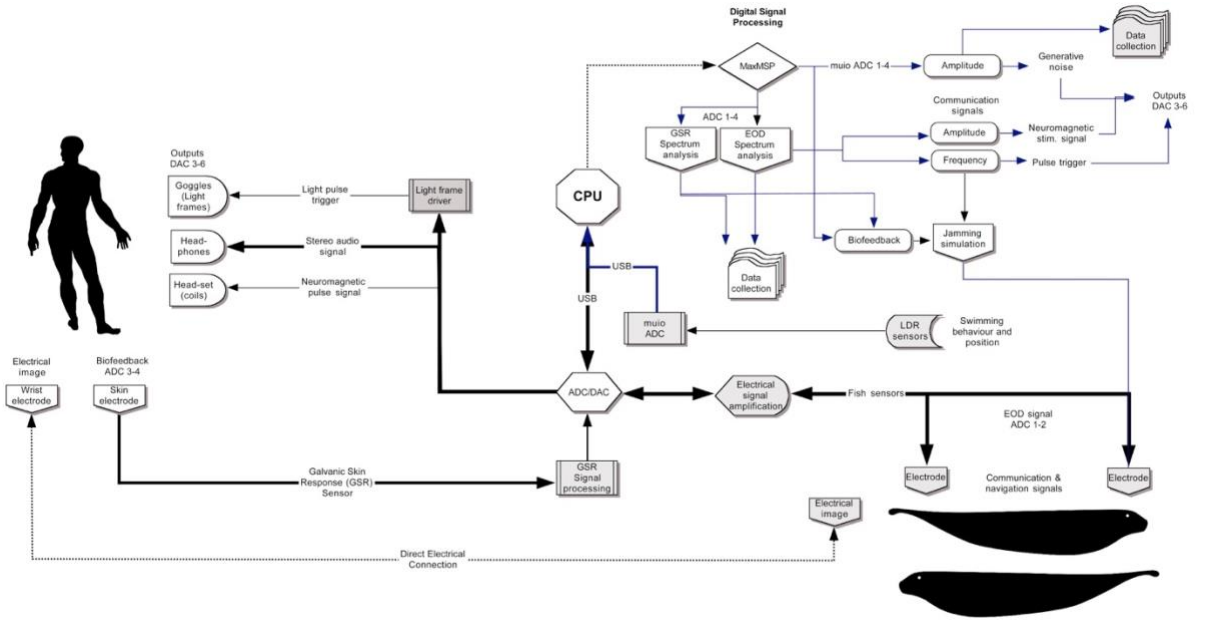


Figure 5: Enki, Experiment 3, 2009

The final Enki workshop, titled ‘Brain Hacking’ (Hackteria, 2012) took place at Kapelica Gallery in Slovenia. For this workshop a custom circuit was produced, which was devised in collaboration with Dr Marc Dusseiller. The 'Fish-Brain-Machine' (Figure 6, Appendix 9) is a "fish-shaped circuit with two light-emitting diodes, which blink at varying speeds determined by the level of humidity of the fingers that manipulate the device…to be placed in front of closed eyes so that one can experience a psychedelic, unpredictable sequence of lights and

colours – a way of bridging technology, mysticism and subculture" (Magrini, 2013:65). It used biofeedback (GSR) to control stroboscopic LEDs. Holding the circuit to the eyes induces the kind of psychedelic visual effects commonly associated with dream machines, wherein colourful, geometric, fractal like forms are experienced by many users. This workshop used other experiments and activities related to perceptual illusion (the Ganzfeld and the Rubber Hand Illusion) and can be considered as an early iteration of the Re/mapping Perception workshop (outlined in Section 4.2).

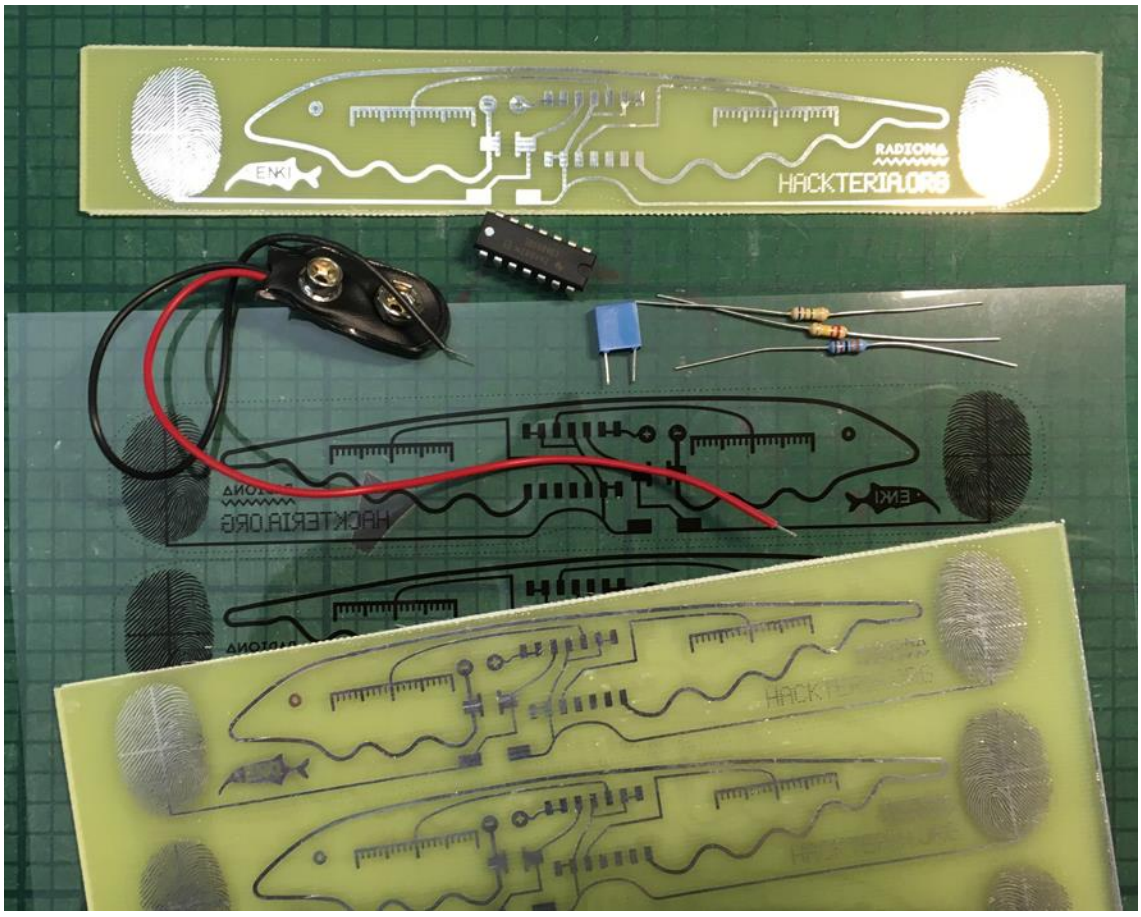


Figure 6: Fish-Brain-Machine PCB, Radiona edition 2018.

1.5.1 Collaboration with BEAM Lab

In parallel with the themes developing through the Enki project, a number of further explorations into perceptual illusion, sensory deprivation, and out-of-body experiences, led to the initial connection with Body Eyes and Movement Lab (BEAM Lab) at the University of Manchester[30]. It was Elizabeth Lewis[31] who introduced me to the rubber hand illusion in 2011. After some initial meetings and experimental sessions[32], we developed a workshop[33] on the subject of perception and body image. Working with only limited resources, clay was used in place of replica hands to conduct RHI experiments, en masse, with large audience numbers (over 500 per day the course of weekend). These experiments led to some interesting discussions around testing the limits of the illusion. These ideas are developed through this research and directly inform the clay hand illusion (CHI) (discussed in Section 4.1 and 5.1). In 2015, another series of workshops, devised in collaboration with Dr Ellen Poliakoff and Dr Emma Gowen (also of BEAM Lab), which used the portrait collection at the Whitworth Art Gallery[34] to explore the relationship between art and science. The workshop was themed around how humans build connections with different visual representations of the body, whether they are, for example, paintings or prosthetic limbs. These workshops were a synthesis of traditional artistic methods (using elements of drawing and sculpture, intermixed with science) as a basis for tactile sensory play and perceptual experimentation. Over this extended time frame, various elements from experimental psychology osmotically permeated into the practice. The experiments continued to develop and were repeated many times over within the practice. This iterative process ultimately resulted in the proposal for this doctorial research.

This present study is primarily informed by on-going discussions with Dr Poliakoff. The collaborative process is mixed between seminar groups and advisory meetings — an extended background presence within BEAM Lab. This, with intermittent exposure through

[30] "BEAM lab is jointly run by Dr Ellen Poliakoff and Dr Emma Gowen, based in the Faculty of Biology, Medicine and Health. Who are interested in how our brains use sensory information such as vision and touch to move and interact with the world around us." blogs.manchester.ac.uk/beamlab/ [Accessed on 10th April 2020].
[31] At the time a PhD Student at BEAM Lab.
[32] This included developing variations on the RHI and attempting to recreate the simulated out-of-body experience experiment.
[33] At Museum of Science and Technology Manchester for Manchester Science Festival 2011.
[34] The Whitworth is an art gallery in Manchester https://www.whitworth.manchester.ac.uk/ [Accessed on 13th July 2019]

discussion meetings and workshops, has enabled insights into the working processes and spaces of scientists, in addition to exploring the field more widely through the literature. The most valuable element of the collaboration is the regular meetings during which we discussed ideas and experiments. Dr Poliakoff described the collaboration as a 'melting pot process'[35], referring to my methodology of returning to the studio to develop on the ideas within the practice, making prototypes, conducting workshops, enacting the experiments, and discussing outcomes and observations (an idea expanded upon through the notion of the interface object in Section 3.3).

[35] Personal communication / meeting, BEAM Lab, September 2018.

1.6 Summary and Thesis Structure

This chapter has introduced the practice and the key ideas explored in the thesis through a unique perspective formed through practicing at the interface between art and science. The chapter has contextualised the practice within the field of interdisciplinary science art collaboration, and has shown that this is a broad and rapidly changing field. This suggests a need to develop a new framework of practice in order to situate the research. In addition, this chapter outlined the previous work, motivations, and key questions that led the research.

The following chapters will show that through recreating scientific experiments and adopting scientific methods within the framework of expanded art practice, the workshops and the research methods became the body of work. Furthermore, it is illustrated that repurposing scientific experiments under the lens of artistic research led to new findings, new experiments, and questions of interest to scientists and artists.

Summary of chapters:

Chapter 2: Literature Review explores and defines different examples of workshop-like experiences and practices these range from participatory art, socially engaged art and experiential art in order to further contextualise this research.

Chapter 3: Methodology develops the methodology which draws from existing models of artistic research, and a conceptual framework based in post-phenomenology. This chapter articulates the crucial methods used and the model of the interface object to articulate cyclical processes of enquiry informed though the expanded practice.

Chapter 4: Workshops details the workshops and workshop-like experiences that took place through the research, and how these methods evolved. A critical development was the Hall Anomalous Perception scale (HAPS), a set of instructions and questionnaires that act las the score for the workshop. This uncovers a performative aspect in the work which had implications for the practice, as well as enabling insights and its positioning within the field.

Chapter 5: Three Experiments focuses on the participatory experiences, expanding upon and detailing the specific experiments; in addition, this chapter focuses on the scientific methods adopted within the practice and how the process of analysis helped to further inform the research. This chapter develops a notion of expanded documentation, whereby, in addition to evidence of the workshop, the data and analysis of the experiences provides insight into the experiences and further serve to inform the work.

Both Chapters 5 and 6 illustrate the generative effects of the workshop within the practice as an evolving process, as interface objects within the expanded practice.

Chapter 6: The workshop as art reflects on the potential framing of the workshops as art and how this might affect the experience of the workshop, both in terms of participation and from the perspective of a viewer. This chapter suggests that a further sequence of testing is required to see how these workshops might be understood more clearly as a distinct art form.

Chapter 7: Sum Total of All the Actions explores the workshops through their presentation as artworks in an exhibition context. It discusses the work from the perspective of the passive viewer. This leads to a discussion on the role of documentation in presenting the workshop as an artwork.

Chapter 8: Workshop Editions elaborates on the thinking which led to creating limited edition workshops and scores, which are either completed through the workshop or potentially enacted by others. A description is given of the workshop resources, boxes which contain instructions and materials for the workshops, and how these are interlinked with digital resources is and certificates of participation.

Chapter 9: Conclusion shows how the research and its outcomes, artworks, and emergent questions, and significant findings have worked together to address the original research question as well as the impact of the research. Finally, it reflects the transformative effects to the practice and suggests directions for future study.

2: Literature Review

This section sets the context for the practice, the critical dialogues and networks it spans, and identifies some examples of expanded art practice, e.g. works that resemble workshops and lab-like environments. This chapter aims to define the meaning of a workshop as understood through this research. It begins by defining the term 'workshop' and exploring the idea of the workshop as a laboratory of experience. Examples are given of experiential art, perceptual experience as art, gallery-based works — workshop-like experiences which function as experiments where the participant co-creates the experience in collaboration with the artist. Other examples are given which are more recognisable as workshops (workshop as a test lab, or as a research tool). This chapter offers criticisms, and, in conjunction with Chapter 1, suggests there is not a comfortable space in which to situate the practice. The following sections aims to render the term down to the elements that have meaning for this practice.

In addition to the work with Dr Poliakoff and a broader network of peers working in the field of science art collaboration, this research is informed directly through ongoing discussions and weekly meetings with two practitioner led interdisciplinary collectives: 'para-lab' and 'Proximity'. para-lab[36] are a group of 17 artists scientists and makers, consisting of several overlapping working groups[37] exploring science and art collaboration. Proximity[38] are a collective of six post graduate researchers exploring practice and artistic research methods. These collectives are interlinked by an interest in interdisciplinarity and creative process. Both groups are motivated by a need to make space (outside the academic context) to facilitate critical and reflective practice, through self-organised workshops, field trips, exhibitions and residency projects. These collectives form the foundations of a supportive network, and ongoing discussions, which had significant osmotic effects this research, the key points of which are referred to throughout the thesis.

[36] para-lab was instigated by Anni Carpenter and Andrew Wilson to facilitate collaborations between artists and scientists. http://para-lab.org/ [Accessed on 20th April 2019].
[37] One of which, the 'perception group', includes me and Dr Poliakoff.
[38] Proximity is a collective interested in the spatial and social elements of practice-as-research. https://www.instagram.com/proximity_collective/ [Accessed on 20th April 2019].

2.1 Workshop: Definitions and Examples

The term 'Workshop' is an umbrella term for a range of activities. From an educational perspective, a workshop is a type of interactive training, as opposed to a passive lecture. It is a space in which skills are shared and developed. The workshop can also be considered a form of public engagement: a means of bringing the art to a new audience. The workshop can add value to other artistic experiences as an additional cultural output/product. Before discussing how a 'workshop' can be 'art' and how experiments can be art, it is first necessary to define what is meant by 'art' and what is meant by 'experiment'. What is a 'workshop'? More specifically, what is an 'artists workshop'? For each term, there are a myriad of possible interpretations, depending on the position from which they are viewed.

2.2 Laboratories of Experience

In an artistic context, a workshop may be considered as a group event in which skills are shared or ideas developed and explored in relation to the artists own practice, or to an exhibition. The phrase 'workshop' has certain practical connotations, relating to getting a job done and is suggestive of some form of practical outcome. A workshop is a place concerned with the practicalities of making, or a group activity aimed toward identifying problems and working towards solutions. A workshop may also be referred to as a 'lab'. The word 'laboratory' has its root origin in the Latin *Laborare*, to labour, to work. So, in this way it is also a kind of workshop, but it is firmly associated with the practice of science, with testing, and experiments. The workshops I create through my practice are clearly similar to laboratories in that they focus on the performance of experiments and employ some of the more formal methods associated with science. However, it is the experience of the process of experimentation that is the main outcome.

Pythagoras makes the first mention of a home laboratory, a workshop like space, where he is said to have experimented with sound and vibration. Though Pythagoras clearly was conducting 'experiments', at this time there was no word for experiment as we understand it. The word experiment has its root origin in the Old French word *esperment* which is related to observation, trailing practical knowledge and cunning, often in relation to enchantment,

magic and sorcery[39]. The notion of experiment and experience are entwined in their meaning, the idea of 'experience' in the way we understand it in terms of 'sense' and 'feelings', was first recorded in the 1580s[40]. This connection with experience and experiment seems deeply fitting in the remit of this research and in the progressive, meliorative framework of experimental phenomenology and somaesthetics[41] (discussed in the methodology Section 3.4).

2.3 Workshop as Research Tool.

Workshops can seek solutions to problems through facilitating discussion among participants, potentially becoming a medium for research, development, or the creation of an artwork. Tania Bruguera describes her socially engaged practice as a form of Art Útil [42] (meaning 'art as tool' or 'useful art'). Her project 'Arte Útil: Art as a Social Tool' (MOMA, 2018) and '*School of Integration'* (MIF, 2019) took the form of large formal classrooms. Local community members were invited to devise 'classes' on the theme of immigration and cultural identity. The workshops brought diverse groups together to confront urgent issues. Thus, the work served a practical function as a potential tool for social change. The art (in this case, the 'school') served as a carrier medium for the educational classes. Bruguera states, "In socially-engaged projects, I'm not the author but an 'initiator'" (Pes, 2019:online). It is the instigation and occurrence of these classes, rather than the classes themselves, that constitute the artwork.

Another example of the workshop as a research tool is Labyrinth Psychotica (Kanary, 2016). This artistic-research project aimed to simulate the experience of psychosis using an immersive, multisensory (tactile and sonic), maze-like environment. The work aimed to not only portray an experience of psychosis, but also an experience that was 'artistic'[43]. The 'case

[39] Online Etymology Dictionary: Experience https://www.etymonline.com/word/experience [Accessed on 1st September 2019]

[40] Online Etymology Dictionary: Experiment https://www.etymonline.com/word/experiment [Accessed on 1st September 2019]

[41] Somaesthtics is defined as the "the critical, meliorative study of the experience and use of one's body as a locus of sensory aesthetic appreciation and creative self-fashioning" (Shusterman, 1999).

[42] Argentine artist Eduardo Costa wrote the *Manifesto de Arte Util* in 1969 https://www.arte-util.org/ [Accessed on 20st September 2020]

[43] Speaking from my experience of the work, it did seem effective in conveying elements of this experience, such as loss of personal boundaries, and blurred borders between the body and space.

study labyrinths' were developed through workshops which informed the creation of the final work. This is an unusual example of workshop's dyadic potential as both workshop and artwork[44]. The work exists not only as an installation in its own right, it is also further expanded through workshops and as a training tool for families and social workers. As an installation, Labyrinth Psychotica functions as a standalone work, and the artist is not present with it. However, as a workshop, the artist is present with the work and leads activities in relation to the art installation; this process then simultaneously informs the research and offers a learning experience for its participants. Through this research, I also experimented with showing the workshops as standalone artworks (see Chapter 7). The possibility that these workshops could be used as tools by others without my presence is explored through creating instructions and resources through which the workshops can be re-created by others (see Section 8).

[44] This duality bears similarities with the Enki project.

2.4 Workshop as Test Lab

Another model is the idea of workshop as test lab; this event is designed to allow the artist to share their specific practice through offering a direct experience of it to test their work on an audience. The Institute for Unstable Media's 'Test Lab' series, provide an "art-oriented test environment, usually absent in the studio or laboratory" (Institute for Unstable Media, 2020). The idea is that 'each visitor is transformed into a participant' and, in this way, 'becomes their own audience' (F Van Darte, 2016:Online). This hybrid between artist presentation and hands-on demonstration resonates with the notion of the expanded art practice, alluding to the workshop as a performative space, a prototype which is then tested through participation. This is similar to the original Enki workshops, one of which took place, in a test lab format, at Institute for Unstable Media in 2008.

2.5 Workshop as Parameter

Creating a workshop involves creating a plan, which is similar to creating an instructional score for a performance. Unlike performance scores, however, workshop plans are not widely circulated as artwork and are generally for personal use. A workshop, then, is an event in which sets of instructions are enacted or realised; it is a defined experiential boundary. Alan Smith's 'Parameters' (2009) is an ongoing project exploring what he describes as the 'conditions of shared experience'[45]. Participants are invited to a location and asked to follow predefined rules for the duration of the 'parameter', during which speaking is not permitted[46]. This is an interesting form of sensorial deprivation, which is created through disrupting the normal course of social interaction. Smith aims to highlight the significance of experiences and how our understanding of these can be affected by the proximity of others when 'their personal accounts of the same event are shared or adopted' (Smith, 2009-

[45] "By creating and prescribing the parameters of unique social contexts – located in an underground mine, a Northumberland pub, a hotel in Plymouth, Smith facilities durational live events for groups of people who share the same rules of engagement. Each Parameter event is unique, however common threads include the prohibition of entertainment devices, recording, documentation, speech or conversation" (A. Smith, 2009-07:Online).

[46] Alan Smith, speaking about the parameter that took place at a pub recalls how '…we had the whole bar and a barman. Drinking was allowed, but from the moment of arrival no one talked. At one point this guy started crying, just sobbing…another time everyone just burst into hysterical laughter. It was Fxxking mental." (Personal communication, 2018)

07:Online). Smith describes these as 'durational events' and 'happenings'; this language is rooted in the 'situationist'[47] terminology.

Smith's notion of parameter is somewhere between workshop and experiential art — an experience that takes place within given parameters in which artist is present, as an active participant rather a leader. After the event, formal processes of discussion and reflection take place, which is more in keeping with a workshop. For the participant, having experienced the work (arguably as co-creators), they now become custodians of this work, embodying one of the few records of its occurrence.

2.6 Experiential Art / Art as experiment

The word experiment has two meanings: the more traditional scientific sense of testing a hypothesis — a test that is done in order to study what happens and to gain new knowledge — or the more exploratory meaning, as follows. Andrew Pickering states that many contemporary artworks and practices would fit into the latter definition (Pickering, 2016:1). In many ways, the methods used by experimental psychologists to explore subjective experiences of perceptual illusions resemble those of experiential art – specifically, in that an experience takes place inside a controlled artificial environment. Both practices require participation and are open to interpretation based on the subjective experiences of participants. The work is then completed through co-creation in the mind of the participant. Although it can be argued that any art is experiential art, since even a painting is experienced in some way, experiential art can be defined more specifically as work which "requires the viewer to activate a space where the work exists…it can also describe individual works of art that require participation from the viewer" (Page, 2018:online). John Dewey defines *'An experience'* over experience in general:

[47] Allan Kaprow coined the term 'happening' in the 1950s to describe durational performance events.

> *'… we have an experience when the material experienced runs its course to fulfilment. Then and then only is it integrated within and demarcated in the general stream of experience from other experiences... Such an experience is a whole and carries with it its own individualizing quality and self-sufficiency. It is an experience. (Dewey, 1934: 414)*.

By this definition, experiential art should also be defined by a start and end point, with rules or parameters, which act as a frame in which the participant is positioned inside with the work**.** In other words, the (subjective) experience unfolds within those given parameters, within the mind of those who experience it.

Olafur Eliasson is known for his immersive environments, large-scale architectural interventions which employ the use of elemental materials, and perceptual phenomena. The experience of the work and movement through its space are crucial. The use of immaterial phenomena, such as light, force the 'participant' to become aware of their own inner perceptions. The work focus on the inner experiences of the 'viewer', an idea further reinforced through the titles of the work, such as 'See Yourself Sensing' (Eliasson, 2001) 'Your Black Horizon'(Eliasson, 2005). Eliasson believes that he is sharing the work with the participant and that the work is the experience. He writes that at the moment of sharing the work, the viewer takes ownership, when "…it takes shape in your presence. Just like a building, an artwork is, essentially, a relationship. It is reality-producing" (Eliasson, 2016:online). The participant is a component part of an 'experiencing machine' (Eliasson, 2015:online) in which the experience is co-created in collaboration with the artist.

Carsten Holler often re-appropriates science for the purposes of art, staging 'quasi-scientific' experiments (Windsor, 2018:online) that transform the gallery into a laboratory, sometimes disorientating the viewer, or, more appropriately, the participant. Carsten Holler's exhibition *Decision* (Holler, 2015) offers the visitor a series of choices as they enter the gallery. Visitors are invited to sleep on automated roving beds, or to move through doorways towards a destination unknown. Many of the works require the participant to travel through them or offer the opportunity to make decisions, further reinforcing a notion of experience as experiment. 'Kit for Exploration of the Self' (Holler, 1995) and 'Upside Down Glasses' (Holler,

1994-2018) are both workshop-like group experiences that verge on performance, each directly re-appropriating methods from experimental psychology[48]. Holler's works often make a play on spectatorship, turning participants into the objects of observation, acting to invert the scientific gaze. When asked if his work bridges art and science, he claimed that he only uses the experimental form, rather than simply introducing an experiment to the gallery; "In art the experiment is more of an experiment with oneself, without tangible results — there's no objective observer collecting data and drawing conclusions" (Birnbaum, 2017:online). The work of both Eliason and Holler continue the experiential turn away from objects and towards perceptual experience. However, Ralph Rugoff offers a critique of this kind of work, stating "populist immersive or participatory installations" offer only a sanitised experience or "…innocuous family entertainment" in comparison with the "…more subversive types of audience engagement undertaken in the 1960s" (Rugoff, 2014:online). In my own experience of working galleries and museums it has been a necessary and often challenging requirement, to deliver workshops and create experiences that are accessible to all[49].

Through this research I have focused on developing smaller scale workshop experiences in order to develop a more in-depth exploration and critical dialogue. The clay hand illusion workshop took place as a one-to-one experiences (Section 4.1) as well as a large-scale public workshop that was accessible to children and adults alike (Section 4.5), crucially I am present within the work to collect data and interact with participants. The workshops developed through this research demonstrate elements of Brigitta Zics' 'Experiential Art Manifesto', of which the following three points are most significant:

> "…12. Experiential Art uses sensor technologies…to comprehend the viewers and viewer re/actions better.
>
> 13. Experiential Art uses technology to expose individuals to its effects. It often creates a feedback loop by altering the artwork in response to an individual's (affective) actions.

[48] Specifically, the inverted vision and inverted body experiments of George Stratton (Stratton, 1896) and others.
[49] Children, teens, adults, grandparents.

> 15. Experiential Art uses progressive methods of video capture; data collection and advanced user experience methods may provide the most effective ways to document such works…" [50]

Points 12 and 13 both specifically relate to the use of sensor technologies to feedback into the experiences (see Sections 5.4.3 and 9.4). I also consider the process of interviewing participants about their experiences, and the subsequent analysis of these (as discussed in Chapter 5) as a means by which participants feed back into the ongoing development of the work. This process was made possible only through my presence in the workshop. Note that Point 15 references 'progressive methods of data collection' as being effective ways to document such work, hinting at the problems of documenting experience suggesting a utility for 'expanded documentation' such as graphs and data visualisation (as discussed in Section 5.5).

2.7 Summary

In addition to Chapter 1, this literature review has further detailed the context for this research. It has provided different examples of practice, many of which are workshop-like while others are more similar to experiential art. Both demand participation and endeavour to elevate the participant from routine perceptual engagement with aesthetic art. Alva Noë encapsulates the potential of experiential art as a tool of phenomenological exploration that allows us to "catch ourselves in the act of perception" (Noë, 2000:128). Likewise, Hantelmann suggests that the essence of experiential art lies in its "capacity to trigger this experimental self-relation" (*Hantelmann*, 2014:10). This is how I see my workshops: as encounters that encourage participants to reflect on their own subjective experiences. The key difference between the workshop and experiential art is that an experiential artwork does not necessarily require the artist to be present in the work or to be aware of the participant's experiences.

[50] Extracted from Brigitta Zics 'Experiential Art Manifesto' (Zics, 2015:online).

The process of drawing together these examples of practice has informed my thinking and reflections on the role that workshops play in my work, as encounters that exist between participatory experience and workshop. However, there is no neat category in which to frame my practice or the works produced through it. In light of this, through this thesis I develop a framework of practice, and the concept of the 'workshop as art' in order to better situate the practice. This research has not only brought forth a new body of work, it has also had a secondary effect: re-positioning the perceptual illusions as art experience. In doing so, it has enabled an in-depth exploration which has led to emergent findings and new questions which are of interest to both artists and scientists.

3: Methodology

As was shown in Chapter 1, the practice draws together elements of both science and art to create new experiments. It is a process of enquiry driven through experiences, installations, and workshops. Chapter 2 identified similar methodologies of practice, but suggested that there was no comfortable frame within which to situate this research, and that there is a need to develop a more defined framework of practice. The purpose of this chapter is to outline the methodological approach underpinning the research, to define some key terms, and to show how these ingredients are brought together within the melting pot of the practice to form a hybridised methodology. This chapter begins by aligning the practice with recognised models of artistic research and by outlining the methods employed in the research (Section 3.1 and 3.2). The concept of the interface object is articulated; a transformative process of cyclical experimentation embodied within the workshops (Section 3.3). Finally, a conceptual framework is defined; this is based in a phenomenology that encompasses elements of somaesthetics, the utility of which is exemplified through a practical example (Section 3.4).

3.1 Artistic Research

This research is practice-based, and as such is informed by my own methodology of practice, as outlined in Chapter 1. This is grounded in practical experiences, experiments, and interactions with others that inform the direction of the work. A number of different artistic research models are recognised within the academic framework. A Practical Guide to Arts-Related Research (Savin-Baden and Wimpenny, 2014) gives a useful definition of practice-based artistic research as a form of arts-based inquiry which "result(s) in the emergence of new knowledge that has both operational and practical significance for the area of practice being researched" (Savin-Baden and Wimpenny, 2014:6). The key methods employed by the practice are the workshops: repeated iterations informed by a reflective process after each workshop based on the reflective cycle (Gibbs, 1988; Schön, 1987) a method of experiential learning, reflection and conceptualisation.

Historically throughout my practice I have been interested in open systems that operate on the edge on functionality, and, as a result, are conducive to accidents and serendipitous

incident. These difficulties and problems are amplified and become features of the work[51] (leakages in pipe for example, and the maintenance of the work). Using clay in place of a replica rubber hand in the RHI came about due to a lack of resources, which then became a research opportunity and led to new questions, which then led to this doctoral research. Another example of changes to the experimental model was partly due to the uncontrolled elements of the research, which led to creating navigations that took advantage of the many different uncontrolled conditions encountered as a result of having to do workshops within very limited timeframes across many locations.

Artistic research thrives in the liminal spaces between disciplines (Schnugg, 2018:55), such as those between science and art. It has an ability to destabilise boundaries; as Mika Elo states, "artistic research practices tend to be transformative, which means that they deliberately touch upon their own opacity" and in doing so create "friction that offers a starting point for opening up exploratory spaces….artistic research practices question the conditions of explication – that is, processes of unfolding, foregrounding something with the help of something else. In other words, they engender processual symptoms through opacity and friction." (Elo, 2017:30). I propose that workshops undertaken through this research operate in this way, as exploratory probe-heads 'Interface Objects' that are generated at these boundaries (this idea is expanded upon in Section 3.3).

[51] See final point of Tabletop Experiments Manifesto (Appendix 13)

3.2 Methods

A significant method employed through this research is the use of interpretative phenomenological analysis (IPA) (J. A. Smith and Osborn, 2015). IPA is a qualitative approach based in phenomenology which has been used within an art context[52]. IPA introduces the use of questionnaires interviewing, and the analysis of these materials into the practice (discussed in detail in Section 5). The use of IPA in conjunction with the traditional experimental psychology approach is not new, but it is still considered an innovative approach that brings a focus to first-person experience, ideally suited to the study of subjective experiences such as those of perceptual illusion (Lewis and Lloyd, 2010). In using an IPA approach, "the advantageous elements of the study quadruple because of the bonding relationship that the approach allows for the researchers to develop with their research participants." (Alease, 2017).

3.3 Interface Objects

Artistic research situated at the interface between art and science can be seen in terms of 'boundary work'. The term 'boundary work' was created by Thomas Gieryn (Gieryn, 1983), who described this as the "discursive attribution of the selected qualities to science and scientific methods for the purposes of drawing a rhetorical boundary between science and some less authoritative residual non science" (Gieryn, 1999:4). However, the idea of boundary work has since been adapted to the interdisciplinary collaborative design process and even artistic research (Välknolwenn and Mougenot, 2019). Henk Borgdoroff states that artistic research is "an activity undertaken in the borderland between the art world and the academic world" (Borgdorff, 2009:2) and can therefore also be considered as boundary work. This implies that the artistic outputs of such practice, in this case the embodiment of the practice through workshops, can be understood as a 'boundary objects'[53].

Boundary objects have multiple meanings to different disciplines and serve to connect the two; they are the points of interaction, conversations, notes, and metaphors, things which

[52] See 'Arts Informed IPA' (Sadkowska, 2016).
[53] Boundary objects can take a number of forms; information, specimens, field notes, and maps, and are used in different ways by different communities. "Boundary objects are both adaptable to different viewpoints and robust enough to maintain identity across them" (Star and Griesemer, 1989:1).

have value to both participants while not belonging to either[54]. Within this research the objects of research, the experiments, questionnaires, scientific devices and phenomena can be thought of as boundary objects. They have formed anchor points for discussion and formed a collaboration interface around which this research has unfolded (See Figure 7).

If artistic research, specifically science art collaboration, can be considered as boundary work, then the products of this process and the artworks produced through it, can also be considered as boundary objects (Figure 7 and 8 AB). However, I believe that they (the products of the research) can serve a further purpose and that the notion of the boundary object seems too static to apply to processes or experiences, such as experiments and methods operating within this study. Therefore, I have developed the notion of 'Interface object' to describe how boundary objects are absorbed into the practice and changed through an iterative cycle of testing, interactions and feedback that inform, and are informed by the practice. An Interface object has similar functionalities to a boundary object, but with the addition of plasticity. It can reflexively change or be adapted by its user and those who participate with it meaning that Interface objects continue to function beyond the frame of the initial collaboration.

[54] For example, a museum specimen has a different meaning to the curator than it does to an amateur collector or the gallery visitor.

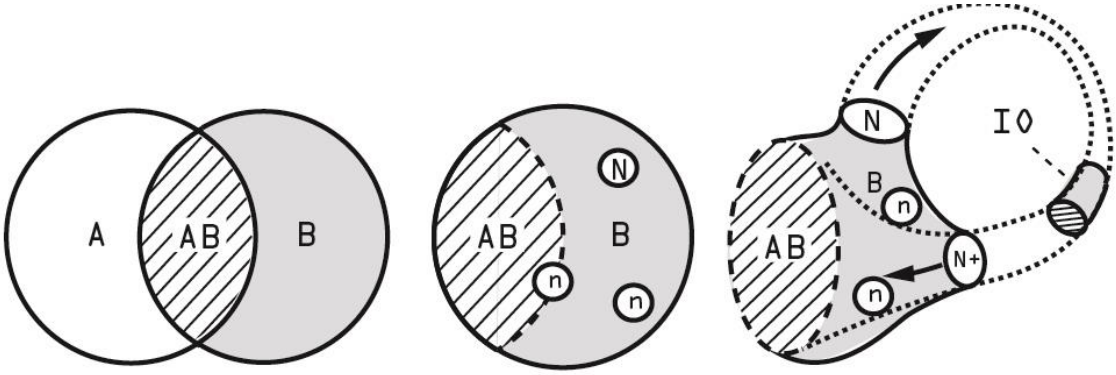


Figure 7: Boundary Objects (AB) form during collaboration (between A and B, such as a scientist (A) and an and artist (B) for example). These boundary objects are osmotically absorbed into the practice (n) and are transformed through it forming new ideas (N) which become sites of nucleation for interface objects (IO).

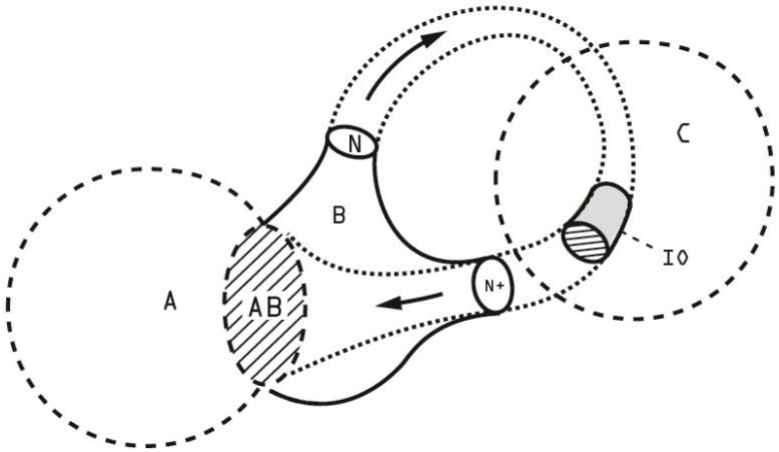


Figure 8: Model of Expanded Practice, showing how interface objects (IO) can move between sites of collaboration (A B and C) and generate new ideas (N+) which are returned to the practice (B) and feed back to the original site of collaboration (AB).

Figures 7 and 8 show how boundary objects (n) exist at (AB) since they are generated through collaboration (A+B). Over time this proximity causes these boundary objects (n) to transmit osmotically into melting pot of the practice (B). Exposed to these volatile and turbulent conditions within the practice a transformative process takes place. Boundary objects become unstable and open to change; they become reactive. New, sometimes unexpected connections are made. These new ideas gather momentum and begin to exhibit a portal like quality (N) which can become the site of nucleation for an interface object (IO). This then instigates a cycle of interaction beyond the initial collaboration (A+B) into new contexts with a range of different participants (C). The interface object collects feedback and data through its

> interactions with other participants and collaborators, which feed back into the practice (B) and the original site of collaboration (A+B)." [55]

Since this is a complex idea, I will ground it using an example from this research (again referring to Figures 7 and 8). We can think about a specific illusion, such as the RHI, as a boundary object (n) existing within the collaboration between myself and Dr Poliakoff (A+B) at the overlap (AB). The RHI was absorbed into the practice (n) and changed through it. An initial idea emerged. This became a proposal for a workshop (N) in which clay was used in place of the replica rubber hand. The workshop cycled through many iterations, as an interface object (IO). The workshop was repeated many times with different groups and contexts (C), which in turn led to new ideas based on those interactions and feedback (N+). In Figure 8, a funnel-like structure is shown which illustrates how this feedback (N+) not only informs the practice (B) but is also directed back towards (AB), thus informing the collaboration, continuing a conversation. As a result, the 'clay hand illusion' became part of "a shared lexicon of understanding"[56] (boundary objects) within the collaboration, whilst simultaneously retaining its generative potential as interface object.

I have framed the interface object here as a part of the methodology, but it can also be considered as a finding that emerged through the research. This thesis demonstrates how this methodology worked in practice and enabled the conceptualisation of the workshop as art. The complex relationship between the interface object and the workshop as art is further dissected in Section 6.3.

[55] From "Interface Objects: Folding Cognitive Distance" as-yet unpublished notes written in response to para-lab discussion 27th January 2021.
[56] Andrew Wilson, personal communications, email 31st January 2021.

3.4 Conceptual Framework

This thesis draws from two phenomenological perspectives: Richard Shusterman's 'somaesthetics' (Shusterman, 1999) and Don Ihde's 'experimental phenomenology' (Ihde, 2012). Phenomenology is the study of the "structures of experience, or consciousness" (Smith, 2018:online). Central to this is the idea of intentionality, i.e. "every act of consciousness we perform, every experience that we have, is intentional: it is essentially 'consciousness of' or an 'experience of' something or other" (Sokolowski, 1999:8). Ihde's notion of experimental phenomenology is a 'Post-phenomenological' (Ihde, 2009) perspective that it sees this intentionality as being in state of continual flux in which meaning is always evolving. Ihde uses a number of practical examples or 'experience experiments' (Ihde, 2012:4) to demonstrate the importance of 'doing phenomenology' in order to fully understand it[57]. Richard Shusterman's somaesthetics also provides a useful practical point of reference in terms of the practice of phenomenology. Somaesthtics is defined as the "the critical, meliorative study of the experience and use of one's body as a locus of sensory aesthetic appreciation and creative self-fashioning" (Shusterman, 1999:302). Shusterman proposes somaesthtics as an art of living, which can be split into a number of sub-disciplines. For example, pragmatic and practical somaesthetics encompass forms of disciplined 'bodily practice' such as tai-chi, yoga, and meditation (in relation to this, I have referenced mindfulness and mindful practice[58] throughout the thesis). Many of the works created by Carsten Holler and Olafur Eliasson "visualise basic elements of somaesthetics, particularly with regard to embodied creation and perception, the interactive dialogue with the viewer and the surroundings, the unification of art and experience as well as the hope of being able to benefit life" (Bukdahl, 2015:160). Researchers have realised the potential of somaesthetics to improve the creative process using daily mindful practices such as meditation and using the body scan activity[59] in design and interaction research (Höök et al., 2015; Lee et al., 2014; Schiphorst, 2009).

[57] One example is the 'Necker cube' optical illusion (Ihde, 2012:63).
[58] These were used as perceptual warmups, initiations, or icebreakers in the workshops.
[59] The body scan is widely used in mediation.

Over the course of this study, acting on this idea of doing or practising phenomenology, I worked with Feldenkrais[60] practitioner Teresa Brayshaw (Section 4.6) and gradually implemented the somaesthtic approach, which ultimately informed the artistic output (see 'On the Inwardly Generated Image' Appendix 11). The 'Spontaneous sensation experiment' (Michael and Naveteur, 2011), draws together mindful practice and perceptual illusion (see Figure 9 and instructions below). This simple experiment has been utilised throughout this research in workshops as well as during conference presentations. This experiment was used in conjunction with the 'invisible hand illusion'[61] and drawing without looking[62], as warm-ups or initiations[63] within the workshops and provide incremental levels of focus and concentration that build towards the experience of perceptual illusions.

Experiment: Spontaneous Sensations

a. Put a piece of paper in front of you, mark a small 'x' on the back of your hand.

b. Place your hand on the piece of paper, palm down, without any pressure and with the fingers slightly apart.

c. Draw around it.

d. Set a timer for 1 minute. Start the timer and direct your gaze at the back of your hand. The other hand should be placed on your knee. You must remain absolutely focused on the sensations you are feeling in your hand. Concentrate on the feelings and sensations you begin to experience.

e. When the time is up, make notes about your experience. Use the outline of the hand to draw and map the sensations by shading the areas where

[60] Feldenkrais is a method of enhancing self-awareness through movement and bodily perception.
[61] A version of the clay hand illusion using empty space (see Section 1.4).
[62] Drawing without looking was used as a measure before and after each experiment (see Section 4.1).
[63] Marina Abramović uses 'performance initiations' in order to put the spectator in a mindset that is more conducive to understanding and experiencing durational performance. This didactive process leads into an experience of a performance. The audience become active elements of the performance rather than passive spectators. They become part of the work's documentation. In a similar way to the workshop as 'Test Lab' and the workshops conducted for this research, the role of spectator, practitioner, and participant begin to blend and overlap.

sensations have occurred; use words or symbols to describe them as you see fit. Estimate their overall perceived intensity on a 10-point scale (1 = just perceptible; 10 = very intense but not painful).[64]

[64] Modified from 'The tickly homunculus' (Michael and Naveteur, 2011)

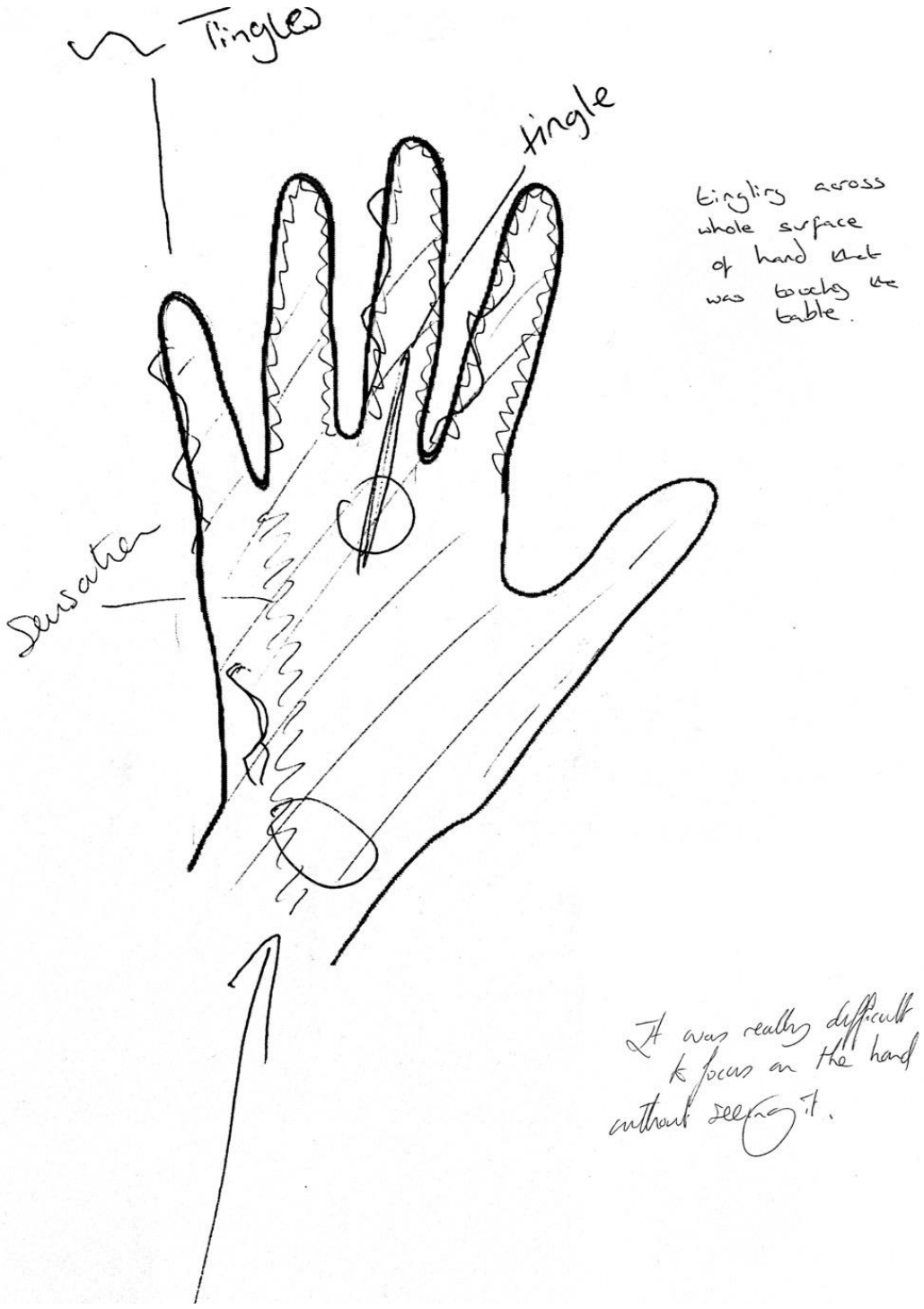


Figure 9: Results from spontaneous sensations experiment with five participants (overlaid to create one drawing).

4: Workshops

Workshops are the primary method of inquiry used in this research. They function as extensions of the practice, exploratory spaces in which new ideas are developed, and crucial developmental tools that sustain and enable the practice. Therefore, workshops form a significant body of this research and its creative output. This chapter works together with Chapter 5, each viewing the research process through different optics. This chapter gives an account of the workshops that took place through the research, focusing on the practicalities of delivering activities and framing the workshop across various contexts. Chapter 5 concerns the experiments that occurred across and through these same workshops, focusing on the experiences of those who took part, the data, and the process of analysis. Both chapters show how these encounters, combined with the new methods adopted, imposed a productive tension upon the practice, which led to changes in the practice that moved to situate workshops as distinct artworks (as addressed in Chapter 6). Both chapters intend to give practical insights on the nature of expanded practice and the different roles assumed by the practitioner. The collective effect of these workshops and experiments is to form a mycelial network of interactions distributed and feeding back across different methods, media, and sites.

A note on workshop formats:

In experimental psychology and one-to-one laboratory experiments, questionnaires and interviews (in addition to the experimental stimuli) are essential tools in the exploration of subjective experience. This format serves as a starting point for the workshops. As will be shown, the workshops evolve through a number of iterations, through different formats and contexts in galleries and studios, as one-to-one experiments, and group, peer-to-peer, and public workshops. As was outlined in Chapter 3, a reflective cycle was used after each workshop, and it is these 'key reflections' that inform the following sections. A pivotal development was the 'Hall Anomalous Perception Scale' (HAPS), a modular resource consisting of initiations and experiments, which was used as a modular plan for the later workshops.

4.1 Clay Hand Illusion Workshops

Various locations January 2018 - June 2018

The clay hand illusion (CHI) workshops took place in spaces that were convenient to the participants, e.g., their studios as one-to-one experiments. Later iterations of this workshop took place as a drop-in at Whitworth Art Gallery, Manchester (a model later replicated at Manchester Art Gallery, see Section 4.5). The aim of these workshops was to use new methods: questionnaires and measurements of proprioceptive drift in conjunction with the illusory experience itself, as generated through visual and tactile stimulation. The intention was to attempt to replicate the RHI model closely; therefore, this 'workshop' was framed more as an invitation to participate in an experiment than as a workshop. In place of the replica rubber hand normally used in the RHI, participants made their own clay hands and followed this up by creating an unfeasible object for further experiments (this experiment is detailed in depth in Section 5.1).

Figure 10: CHI Workshop at Whitworth Art Gallery 2018.

The CHI workshop presented several challenges. As it is a necessity of researching in an academic context following ethical guidelines, informed consent is required from the participants. A number of additional forms (participant information, photography and film consent etc.) also needed to be reviewed and signed with the participant pre-experiment. This activity made a slightly uncomfortable initiation to the workshop. The collection of data (making detailed notes measurements and audio recording of conversations) also added a

certain formality to the proceedings which are more in line with scientific research than an artistic investigation. This contrasted sharply to my previous workshops, the delivery of which was more in line with arts practice, embracing artistic experimentation, improvisation, and mistakes. However, the benefit of seeing this process through was that a data set (both qualitative and qualitative) was collected and later used for analysis (section 5.1). Another successful element of this workshop that clearly broke with the RHI model was asking the participants to create objects for the experiment. Although the workshop was framed differently, the discussion and interactions still resonated with the core principles of the practice and its approach to working with science as a creative medium. However, it had become clear that the process of initiation and the framing of the workshop needed revision to bring this more in line with my own practice. The experiment was weighted towards the gathering of data. In response to these thoughts (acting reflexively within the workshop) the format of the final CHI workshop was changed to a drop-in style workshop at Whitworth Art Gallery. During the course of this workshop, in addition to performing the experiment as a one-to-one experience, I asked some participants to conduct the experiments themselves, using the same methods, while I made observations and notes (a model developed later through workshops at Manchester Art Gallery, section 4.5).

4.2 Re-Mapping Perception 1-2

Re-Mapping Perception 1 / Radiona / Zagreb / 17 April 2018

Re-Mapping Perception 2 / General Practice / Lincoln / 26 July 2018

The Re-Mapping Perception (RMP) workshops built on the original core activities developed through the Enki workshop (Section 1.5) and used similar concepts and approaches. The workshops began with an artist talk, giving some contextual background to the practice and the research, before opening out into a discussion of perceptual illusion, with optical and auditory examples. In this workshop I also began to employ a somaesthtic approach, using the 'spontaneous sensations experiment' and the ‘invisible hand experiment’ as perceptual warmups before the workshop activities. These led into more involved practical experiments: The CHI, Navigations (walking with Ganzfeld goggles on, see Appendix 8), and experimenting

with electro-sense (an activity related to the original Enki workshop[65]). The Radiona workshop, being extended over two days, had additional activities. These included: a development on the CHI, recreating a simulated out-of-body experience using a clay body[66], and, a new Fish-Brain-Machine circuit (Figure 12 and Appendix 9), which was printed specifically for this workshop. The workshop finished with electronic taste perception experiments (Figure 11) which used a circuit to generate an electrical signals of different frequencies and strength with which to simulate a taste-like sensations on the tongue (Appendix 10).

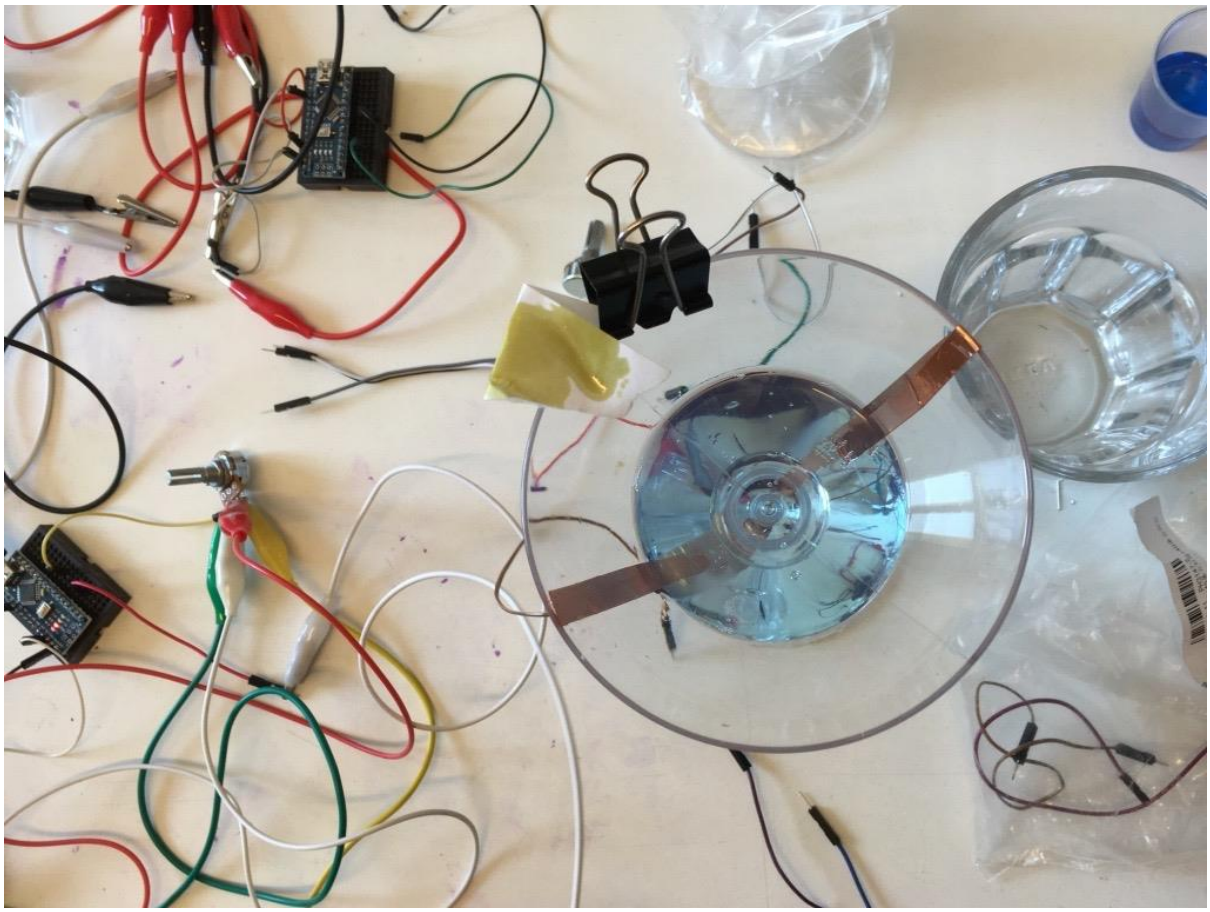


Figure 11: Electronic Taste Perception workshop, RMP 1, Radiona 2018.

[65] Working with electromagnetic fields; making transmitter coils and detectors, extending the sensory field into the electromagnetic spectrum, an activity used in the original Enki workshop (Section 1.5).

[66] A new version of the simulated out-of-body experience (Ehrsson and Valeria, 2008) using a model clay body rather than a manikin (as used in Ehrsson's original). This experiment used smart phones syncing to a video uploaded during the workshop and viewed through cardboard VR goggles, later developed into the Autoscope (Appendix 6).

The success of this workshop was in its initiation through the artists talk and the discussion around perceptual illusion, as well as its framing in the context of artistic practice. This highlighted the importance of providing context to the research and worked in conjunction with the other warm up activities during the initiation process, with 'icebreaker'. The social interactions outside the space of the workshop also led to taking a more informal approach. These workshops were also successful in providing insights into my practice and sharing new skills and ideas[67], and offered an innovative multisensory experience of technology as a creative medium, demonstrating its potential to exploit the senses (sound, taste, touch, and vision).

In both workshops, a wide selection of experiments was used, spanning many different fields of knowledge and sensory experience. These initial iterations of the RMP series were ambitious in their scale and packed with activity. They required a huge amount of preparation (sourcing equipment and materials and making plans) and incurred a time-consuming setup process, with resultant cleaning and tidying away afterwards. There was little opportunity for reflection within the workshop and it was not possible to collect detailed qualitative or quantitative data on any specific experiments. As a result, they were at times intense and stressful experiences. Discussing the workshop afterwards, some participants suggested that although the workshop was engaging, each activity was potentially a day's workshop on its own. The main learning outcome was to consider doing fewer activities and to make more space for reflection within the workshop.

[67] After the RMP 2 workshop one artist continued working with the ideas and incorporated them into their own practice (see Section 9.3)

Figure 12: Fish-Brain-Machine / RMP 1, Radiona 2018.

4.3 Other Experimentation and Workshop-Like Experiences 2018 - 2019

A number of collaborative peer-to-peer workshops, residencies and workshop-like experiences took place alongside the specific workshops mentioned in this chapter, forming an undercurrent of general practice and experimentation that informed the research. I organised meetings with artists at the studio in which we would test experiments together and organise workshop events. For example: 'Night exercise' was a self-organised, off grid weekend residential[68], with a small group of artists and researchers[69], developed in collaboration with Annie Carpenter[70]. The aim was to test out workshop activities developed through the RMP workshops in the natural environment in a relaxed setting with fellow peers. The idea was to allow more space for peer-to-peer discussion and reflection. One significant outcome from this was development of the 'Central-Field' experiment (See Figure 13, and Appendix 8) which led to a number of field experiments using perceptual illusion in the natural environment. This trajectory of research led to creating the 'Autoscope' (Appendix 6), a mobile version of the simulated out-of-body experience illusion (discussed in Section 1.4.2). Although this was never realised as a public workshop, it can still be thought of as several

[68] Middlewood Trust,11-12/09/2018 www.middlewoodtrust.co.uk [Accessed on 20th May 2020].
[69] Including Michele Harrison, Hannah Layton Boyce, David Boultbee, Daniel James, Laura Negus, and Martha Lineham.
[70] Annie Carpenter is an artist and educator also working with science art and perceptual experiments www.anniecarpenter.co.uk [Accessed on 20th May 2020].

workshop-like experiences that occurred within the studio environment and the natural environment[71] (see Figure 14). As will be outlined in the following section, this is how the Hall Anomalous Perception Scale was developed.

Figure 13: Night exercise, Middlewood Trust 2018.

Figure 14: Andrew Brooks using the Autoscope, Rogue Artists' Studios Project Space 2019.

[71] Studio and field experiments took place with performance artist Nicola Dale 11/10/2019, and photographer Andrew Brooks, 19/06/2019 and 20/07/2019.

4.4 Developing the Hall Anomalous Perception Scale (HAPS)

Workshops various locations 2019

In order to address issues emerging from the earlier RMP and CHI workshops, I took part in experiments at BEAM Lab to discover what it felt like to participate in a psychological experiment. I participated in two sessions as a control subject[72], which consisted of structured interviews and questionnaires intermixed with long periods of psychometric tasks[73]. Placed now in the position of participant, I found myself reflecting deeply on the nature of my own perceptual experiences and discussing these with the experimenter. This informed a crucial development: exploiting the formal 'initiation' process — the signing of forms, and the filling in of questionnaires — as a creative opportunity and as part of the workshop experience, rather than in addition to it.

Figure 15:Studio workshops, Rogue Artists' Studios 2019.

The 'Hall Anomalous Perceptions Scale' (HAPS) was developed through eight workshops: six with single participants in my own studio (fellow peers and studio members) and one as a home visit with two participants[74]. The workshops were a simplified version of the Re-Mapping Perception model. These streamlined editions were meant to last one hour, but they

[72] In a study on autism by Daniel Pool (Pool, 2019).
[73] Such as using pattern cards and cubes which were packaged in a small box, I immediately made a visual connection here with Fluxus box sets, a train of thought which informed the visual aesthetics of the box sets described Section 8.4.
[74] A suggestion of Teresa Brayshaw, whose Feldenkrais practice takes place from her own studio, or as home visits.

often lasted one-and-a-half to two hours. The various documents were incorporated into a single document of questionnaires, instructions, initiations, and experiments. I delivered this 'questionnaire' from behind a clipboard, reading out the questions and then transcribing answers directly. This would lead into guiding the participants through simple initiations, such as the spontaneous sensations experiment, and moved on to longer, more challenging experiences of the Ganzfeld and MGE. The HAPS grew into a large modular document, which could act as a script for an entire workshop. This was tested through the RMP 3 and 4 (Section 4.6) and later through the Seven Practical Experiments workshop (Chapter 7). It could also be adapted to smaller workshops (Section 4.7).

The content for the questionnaire was inspired by the many resources (scales and questionnaires) used for the assessment of participants, and for data collection in experimental psychology. For example, the 'Cardiff Scale' (Bell, 2017)[75] and the 'cognitive failures questionnaire' (Broadbent et al., 1982) which are used to measure participants of anomalous experience in everyday life. The HAPS was developed incrementally through each workshop based on participant responses; some questions were removed, and others modified and updated. Some questions elicited a clear yes or no; others left the participant confused, and some seemed to open much broader discussions and reflections. Here are some examples of initiation questions used in HAPS:

> Imagine a square. Pause for a moment to visualise this in your mind's eye.
>
> How does it look? For example, does it have a colour?
>
> What colour is the background? How is it constructed?
>
> Can you turn this into a three-dimensional cube? Can you rotate this cube? Can you put yourself inside the cube and look at the space from within?
>
> Describe this space, the quality of detail, colours, and the quality of the light.
>
> Do you start doing one thing at home and get distracted into doing something else unintentionally?

[75] To which the working title 'Hall Anomalous Perceptions Scale' is a tongue-in-cheek reference.

Do you ever think that things have moved or are in motion when they are not?

Do you ever see shapes, lights, or colours even though there is nothing really there?

Do you ever feel like you are outside your own body?

Do you ever feel like nothing is real and / or that you are living in a dream?

The HAPS began to develop into something more than a questionnaire and was formatted in such a way to leave space to make notes and observations in addition to answers to questions. The instructions for these experiments sometimes became quite elaborate and detailed. For example, the initiation used in RMP 3 (Section 4.6) was fully scripted (see Appendix 11) and used for an initiation in a later workshop (Chapter 7). The later script-like versions of the HAPS were intended for personal use. I wrote these using screenplay formatting, dividing up practical actions and elements of dialogue, provided a way of visually organising the information which was useful as a visual guide when delivering workshops[76]. The script-like questionnaire purposely left spaces for improvisation and making notes during the workshop. The following is an extract from a version of the HAPS that was used for the virtual online workshops (Section 8.4).

2 IMAGINE A LEMON

Testing sensorial suggestibility using the lemon test.

(SHARE SCREEN)

(SLIDE 2 – Imagine a Lemon)

Now, I want you to imagine a lemon.

(Describe the experience of biting into a lemon as vividly as possible)

[76] This was easier to read as a dyslexic.

(improvise)

Can you taste the lemon?

(BACK TO GALLERY VIEW)

Raise your fingers; on a scale of 1-10, how much could you sense the lemon taste?

(RECORD RESULTS)

(DISCUSSION)

The HAPS served as an organisational tool, combining all the separate questions, instructions and forms in to one homogenous document. In parallel with this process, I was also exploring how compact I could make the workshop equipment in light of having to travel with this workshop in the future[77]. In summary, the procedural documents (forms and questionnaires) which at first afforded problems and an awkward initiation to the workshop, now became integral to the process: a guiding script around which to anchor the process and enable discussion. The HAPS is discussed in more detail in the summary of this chapter.

4.5 Clay Hand Illusion, Group Workshops

Manchester Art Gallery, 8th-18th April 2019.

These workshops were commissioned for Manchester Art Gallery as part of their public engagement programme; therefore, the activities had to be accessible to all, with a focus on family groups. The workshop was themed as an introduction to the idea of perceptual and multisensory illusion, framed in reference to several artworks in the gallery which related to the body, illusion, and perception. In terms of this research, this workshop provided an opportunity to test the CHI workshop as a larger scale event, incorporating initiation experiments (the spontaneous sensations experiment, with a new addition of the 'invisible hand'[78] experiment), and to experiment with streamlined data collection methods, using

[77] This was a line of inquiry that ultimately led to very minimal box sets being created for each workshop (see Chapter 8).
[78] The Invisible Hand Illusion is a version of the Rubber hand illusion which uses no fake rubber hand at all. Instead, the participant focuses on an empty space in place of their hand (see Section 1.4).

modular elements taken from the HAPS questionnaire. Because of the large audience, a number of additional activities were tested.

.

Figure 16: CHI Workshop, Manchester Art Gallery 2019.

Eight drop-in style workshops, lasting four hours each, with between 80-150 participants, took place over a two-week period. The workshop centred around the CHI but in this workshop, participants were asked to work collaboratively and perform their own experiments on each other. Even with assistants helping[79], working on a workshop of this scale can be an exhausting experience, as a great deal of energy is used in the practicalities[80] of delivering the activities and ensuring that participants have a fulfilling experience. The additional process of data collection created an extra layer work. A challenge was to adopt a flexible working strategy which would allow reflection in action and data collection, as well as leave space to test new ideas. I created a simplified version of the HAPS (mainly instructions and prompts for discussion) which I could give to participants. They could then absorb this information and perform the experiments for themselves. I could then interject to provide more explanation and demonstration, giving me occasional space to make observations and notes.

[79] Gallery staff, volunteers (both art and psychology students).
[80] Cleaning tables after each activity, for example.

Figure 17: Clay objects, CHI workshops, Manchester Art Gallery 2019.

Because of the scale of this workshop and the wide diversity of the audience, a number of extra activities were used alongside the CHI. These provided some context for the research and the science behind the illusions as well as my own practice. This included a demonstration of the 'invisible body illusion' (Ehrsson et al., 2013), essentially a seated version of 'Autoscope' (Appendix 6) and a new idea based on the 'alien hand illusion' (Jesper, 2018). In each case, participants were invited to play with these illusions while I made notes and observations.

Over the course of this workshop changes were made as it progressed. I acted reflexively with a focus on making more space to observe experiments and interactions from a distance. Observations were made on how the instructions were interpreted, how groups interacted, and the various reactions to the experiments. Having built this space into the activities, it was also possible to test several new ideas in parallel with the main activity, which developed over the course of the workshop into a new artwork (Action Intention Paradox, Appendix 7), which could be a workshop of its own.

Participants were given verbal or text-based instructions and were encouraged to perform the experiments themselves. In some cases these instructions were mis understood and the experiments were performed incorrectly, however, within the frame of this artistic research, it was possible to actively celebrate and build upon these mistakes; in doing so, participants inadvertently devised a series of new and distinct experiments related to the CHI (discussed in Section 5.1.3). This workshop exemplified how adopting a reflexive model can make space to actively respond to developments as they occur, and how these can be used to drive the development of new ideas.

4.6 Re-Mapping Perception 3-4

RMP 3 / Gallery-X / LJMU Liverpool 02/05/2019

RMP 4 / Gallery 39/ Cardiff 17-18/06/2019

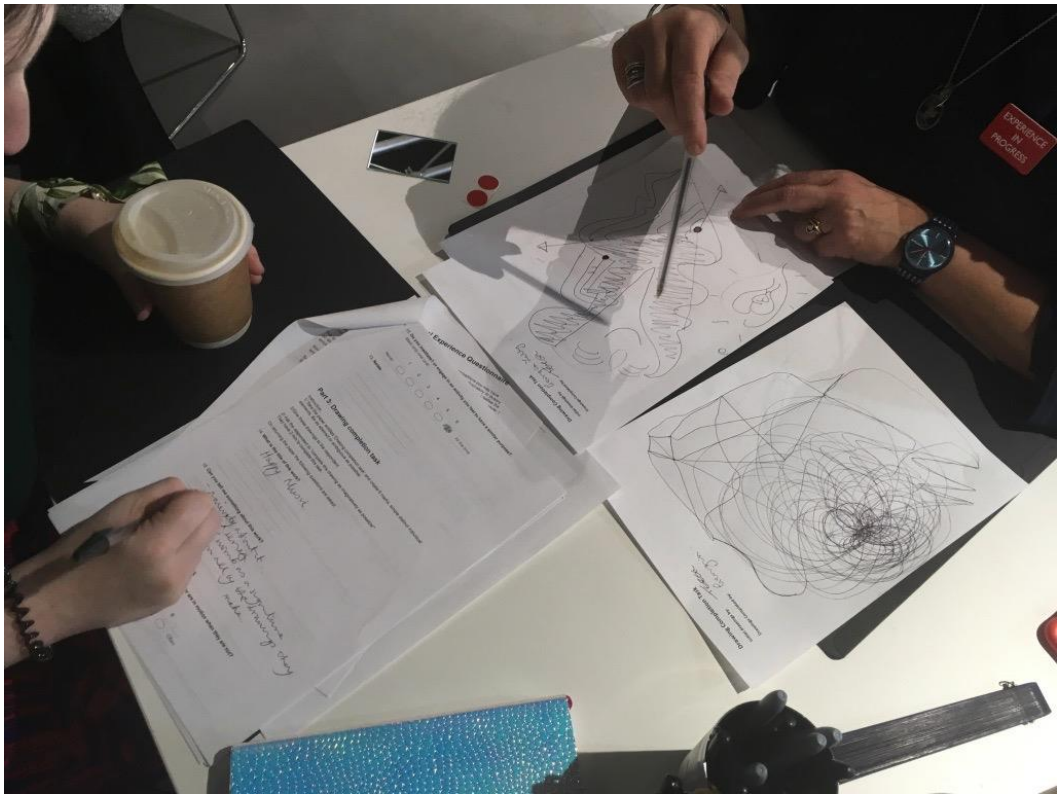


Figure 18: HAPS Questionnaire, RMP workshop 3 and 4.

These workshops took place in galleries with small groups of five to nine participants (artists and researchers[81]). The workshops were based on RMP 1 and 2, but were shaped around the HAPS questionnaire. In place of an artist's talk to provide context to the research, all participants were given an 'Experience in Progress' badge[82] to wear for the duration of the workshop. RMP 3 started with a session of Feldenkrais[83], an 'Awareness Through Movement' (ATM)[84] exercise developed and led by Teresa Brayshaw specifically for this workshop[85]. The session involved seated and floor-based activities relating to the movement of the face and eyeballs, leading into a series of mental visualisations. The idea was that this visual

[81] RMP 3 Madeline Schwartzman, writer and film maker, was also invited to participate and give a public lecture after the workshop about her new book 'Human Futures Expanded' (Schwartzman, 2011), which contains many points of reference informing this research, relating to perception changing devices.

[82] This phrase is related to an encounter that took place in a neuroscience lab that inspired the Enki project and the ongoing theme of perceptual experience within the practice, see Appendix 12.

[83] As mentioned earlier (Section 3.4) Feldenkrais is a practice which aims to 'enhance perception and self-awareness'.

[84] Awareness Through Movement (ATM) excesses sessions focused on different body parts such as the ear, eyeball and face and tongue (see Appendix 11).

[85] After three meetings and a group workshop at Rogue Artists' Studios 08/09/2018

exploration of the darkness behind the eyelid would complement the Ganzfeld experiments mirror gaze when executed later. This activity developed into a new work called 'On the Inwardly Generated Image' (Appendix 11). This was the first time the full HAPS questionnaire had been handed over as an activity that participants would perform on each other. However, in the case of RMP 2, the questionnaire was not fully completed.

Figure 19: Re-Mapping Perception Workshop, LJMU 2019.

RMP 4 took place at Gallery 39 with a small group of five artists. The aim of this workshop was to re-test the HAPS (without the Feldenkrais activity). The key difference to RMP 3 was an extended time frame of two days. With the extra time available, it was possible to fully complete the HAPS and to capture participants' perceptions of the overall workshop.

During the Ganzfeld experiment, one of the participants (P#25) set up his own sound work to create a generative soundscape that reacted to changing ambient light levels (which was affected by the clouds and sun outside). This moment of collaboration was only possible

through being open to changes and interpretation of the instructions and through moving between roles of workshop leader, participant, and observer. This workshop brought up some interesting discussions around the purpose of the workshop, whether it was research or an artistic experience, and what do they get out of it as participants? It was clear that the workshop did not fit with their expectations of what a workshop might be. For example, one participant said that in a workshop they might expect "to get some kind of skills or tools; or to make stuff" (P#23). In contrast, as another participant stated, "I felt you, very generously, shepherded into an experience (…) then in relation to the process of the questionnaire…It's like you're undoing the scientific process and making it something more abstract"(P#25). The discussion opened out to the experience of working in pairs, swapping roles as experimenter and respondent, and how this affected each other's thoughts and answers (something that was also brought up in RMP 3). In both RMP 3 and 4, I was momentarily relieved of the task of acting as an experimenter; it was then possible to observe the workshop almost as if I were an audience member (a thought developed in the summary of this chapter).

As intended, the HAPS questionnaire worked as a structural device within the workshop and as an experience in and of itself. These workshops highlighted the importance of making spaces to reflect across the whole group (participants sometimes instigating this themselves). Additionally, being separated by a table, and filling out the questionnaire created a formal interaction. They found this contrasted to the experience of the Ganzfeld and the MGE, which were performed in a circle and had a 'more democratic feeling' (P#24) e.g. more like a séance[86].

These workshops suggested that there was a need for clarity in terms of framing what the workshop was, whom it was for, and what the intend outcomes were. What was becoming increasingly apparent was that the experiments were no longer acting only as data gathering exercises, but had become explorative tools, instigating discussion. The workshops were more than a space for sharing methods or the ideas embodied in the practice; they were becoming more like provocations with performance-like dimensions. It was a matter of developing a way to clearly frame and articulate this.

[86] This literally conjured an image reminiscent of the illusionist and triggered a sequence of thoughts developed in Section 9.5.

4.7 Mirror Gaze Workshop

Venture Arts Manchester, 14th-17th August 2019

Bruntwood SciTech / Manchester Science Park, 11th -12th February 2020

These short, half hour one-to-one workshops took place across two sites: as part of the Proximity[87] residency at Venture Arts, and as part of a series of workshops developed for Bruntwood SciTech. The workshops used just one experiment as the core activity, the MGE, and it also used elements taken from the HAPS. These workshops used an innovative approach to the MGE, using a two-way mirror and infrared camera, (see Section 5.3.1 and 5.3.3). For the Venture Arts workshop the Mirror Gaze Box (see Figure 21 and Appendix 5) was set up to provide the dark space for the experiment, and at Bruntwood SciTech a wooden booth (Figure 22) was repurposed for the workshop.

Figure 20: Mirror Gaze Workshop, screenshots, Venture Arts.

[87] 'Proximity' was the first in a series of three residencies and workshops building towards a final exhibition, organised by a group of seven post-graduate researchers exploring practice and artistic research methods.

Figure 21: Mirror Gaze Box, Venture Arts 2019.

Figure 22: Mirror Gaze Workshop, Manchester Science Park 2020.

Working with, or in proximity to others (with both passive and incidental audiences) provided some insight on how the practitioner and the research are affected by their environment. For example, conducting the interviews openly while others could overhear led to others joining the discussion and wanting to know more about the work and the experience. This reinforced thoughts that developed in RMP 2 and 3 about the importance of incorporating an informal space for participants to discuss their experiences in a group.

In employing just one experiment as the central focus, space was made available for in-depth reflection. Because of this, new ideas were developed around how this workshop experience, its documentation, and the collected data could be presented as an artwork. A number of creative experiments were made with the documentation. The video footage, sound, and written transcripts from the workshops were later exhibited as part of 'Proximity' (Paradise Works, 2019). These workshops also informed a new piece of work called 'You Are the Object of Your Own Observation' (Appendix 4).

4.8 Summary

The first iterations of workshops undertaken for this research (Section 4.1) emulated a standard experimental model based on the RHI. The early RMP workshops were ambitious and incorporated a wide range of interrelated experiments. From my perspective as a practitioner, these were intense experiences that left little space for reflection. As a result, these yielded fewer outcomes in terms of the research and fewer benefits to the practice. The later iterations of RMP used a new approach in that they were threaded together by the HAPS, a research tool that emerged through adopting new methods and a need to make these more appropriate to the practice: this was a crucial development within this study, which had two main effects:

- Firstly, using the HAPS as a script guided my interactions, and this added structure to the workshop, which created more space for reflection and space to act reflexively within the workshop.

- Secondly, using the HAPS made me personally detached from the situation and this gave me a sensation that I was performing a role behind the clipboard. Similarly, in handing the HAPS to others, I could watch this workshop as if I was a member of an audience. From this perspective, the workshops took on a performance-like quality.

If a workshop is an experience that takes place between a participant and practitioner, then viewing the workshops through the lens of performance necessarily implies a third optic of audience. Figure 23 illustrates an interrelationship between different roles participants can play within a workshop: The two circles on the left show the active 'practitioner' (experimenter), and 'participant' (experiencer); While the three circles on the right, illustrate a performance like dimension, showing in addition a passive 'audience' (observer). In both diagrams all actors converge at the point of the experiment and experience. This reflection on the practice, and my role as participant within it, opened up a new 'performative' dimension to the work. Likewise, in thinking of the HAPS as an instructional 'score', a new potential is suggested in terms of others re-creating or reperforming the work, and the workshops extended ideological existence as instructions.

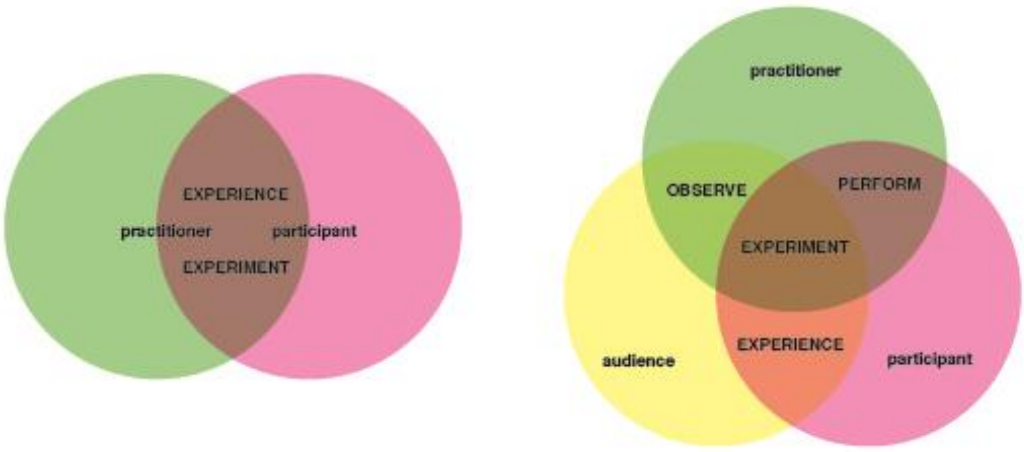


Figure 23: Practitioner, audience, participant interrelations.

The original research objectives (outlined Section 1.0.1) in simplified terms, aimed to employ methods used in experimental psychology to investigate perceptual multisensory illusions within the context of artistic practice. This, in turn, informed a secondary objective — to develop a new body of work that embodied the new methods. In other words, the idea was to engage in a process of research though workshops, which would inform a new body of work, which would in turn be a synthesis of the research. In addition to this new work, a workshop would be developed alongside as a toolkit which would further demonstrate the research. However, as the research progressed, these reflections on the performative qualities of the workshop revealed how the workshops were intrinsic to the practice. I also needed to be present within the work to collect feedback and interact with participants in order to inform future iterations of the workshop. Therefore, the artwork created through this research should retain these workshop-like qualities. This led to a chain of thinking which positions the 'workshop as art', a notion which is developed in more detail in Chapter 6. The following chapter moves on to consider the experiences of the specific experiments that took place through the workshops, and the insights that their analysis revealed and how these further informed the workshops.

5: Three Experiments

Chapter 4 focused on my experience of the workshops and the effect of employing new methods of data collection. This chapter focuses on the experiences of those who took part, and how qualitative analysis is used to pull meaning from the interview data, specifically, in relation to the three experimental models[88]: The clay hand illusion (CHI), the Ganzfeld, and mirror gaze experiment (MGE). For each experiment, the methods, analysis, and reflection on the 'results' are detailed in addition to the subsequent modifications to the methods**.** The purpose of this chapter (as in Chapter 4) is to give practical insight into the methods used through the research and to show how the experiences generate new ideas and feedback to inform the experimental design, and, ultimately, the workshop. The later sections outline the interconnections between the three experiments as well as a technical note on Biofeedback. The final section suggests means by which experience can be documented and explored through analytical processes.

A note on analytical process: Interpretive phenomenological analysis (IPA) involves the use of open ended semi-structured interviews, which are recorded and transcribed. The transcripts are then read, and recurrent phrases are identified and coded (emergent open coding). These are clustered into themes upon which to perform a thematic analysis (Braun and Clarke, 2006). An inductive approach is then used to extract meaning from the collected data**.** In the following sections participants are referred to using their unique participant number (P#), which can be cross-referenced using the table in Appendix 14. Extracts from the data and interviews are presented so that the reader can assess how these themes were defined as recommend by Smith (Smith, 1995). Therefore, the following sections give occasional extracts from the transcripts to help contextualise the data.

The processes of collecting of qualitative data, interviewing, creating transcripts, and their subsequent analysis is also a craft which requires practice and training. Listening and relistening, reading and re-reading, and slowly working through the transcripts also served as a secondary reflective process. This method of data extraction became entwined with a

[88] Each of these experiments could constitute a PhD thesis of its own; however, the accounts given here are only brief insights into ongoing exploratory artistic research processes.

creative process within the research, enabling me to visualise otherwise invisible elements of the practice and the experience of the work. As will be shown in the following three sections, this emergent data began to guide the work, for example, the many new experiments and ideas for new work that came through the CHI workshops, the Ganzfeld navigations and the use of biofeedback and flickering light for the MGE.

Unlike a scientific study, which would aim for "standardisation" of instructions and stimuli, the aim of recreating these experiments was not to find answers as such, but to engage with others in a reflexive experience in a shared process of research. The following section is broken into three parts; firstly, in the CHI, a full cycle is shown from original experiment to published findings in the context of science, while the Ganzfeld and MGE led to a number of research questions for future work. These sections (5.1, 5.2 and 5.3) can be thought of as scores open to reinterpretation within an artistic context (an idea developed further in Chapter 8).

5.1 Clay Hand Illusion

The rubber hand illusion (RHI) (Botvinick and Cohen, 1998) is a well-known illusion that has been studied widely within the field of experimental psychology. In the experiment, participants are seated at a table and are asked to look at a realistic replica rubber hand placed in front of them, at the same time placing their real hand behind a partition or under a platform. The experimenter, sat opposite, then strokes and taps the replica hand in a synchronisation with the hidden real hand. This combination of synchronous visual and tactile stimulation is often enough to convince many participants that the rubber hand is their own. Studies building on the RHI have shown that it is possible to feel ownership over a replica stone hand, or even an empty space. However, attempting the illusion with an entirely 'unfeasible object', such as a plank of wood, spoon, or balloon has proved less successful (Ehrsson et al., 2013; Tsakiris et al., 2010; Kalckert et al., 2019), suggesting that the hand-like appearance is essential for the illusion to work. The 'clay hand illusion' and the 'unfeasible object illusion' are new experiments based on the RHI, which employ several innovative techniques in order to test the limits of this illusory experience. The outcomes of this experiment were discussed in the paper "The Clay Hand Illusion and the Embodiment of Unfeasible Objects" (Hall and Poliakoff, 2020), written in collaboration with Dr Poliakoff, upon which this section expands.

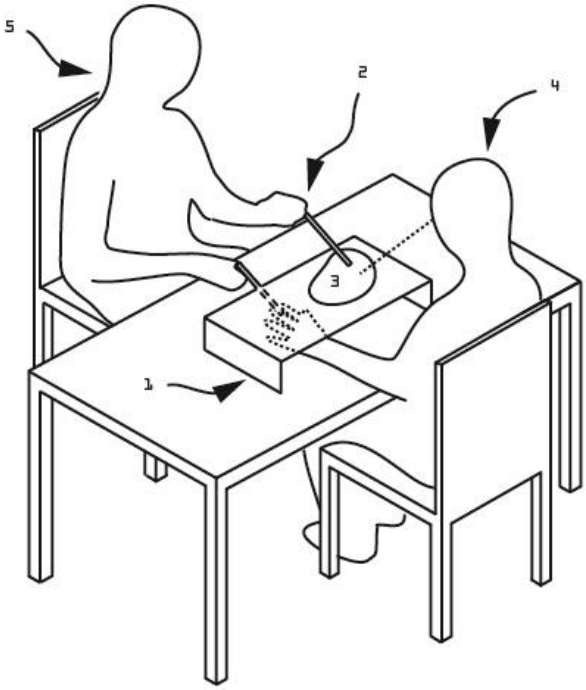


Figure 24: CHI experiment. Raised platform (1), brush (2), clay object (3), participant (4), experimenter (5).

5.1.1 Methods

Making Clay Objects: Participants were asked to make hand-like clay objects and use these in place of the rubber hand, before making unfeasible non-hand objects with which to repeat the experiment (see Figure 25). This means the participant had the opportunity to make decisions and suggestions about what form they would make and how the experiment could be conducted; often, the hand had to be mapped to the object.

*Figure 25: A selection of unfeasible clay objects. (k 1-3) shows the full sequence of objects created by one participant (P#1) the initial clay hand (k1) followed by two unfeasible objects (k2) and (k3). *Indicates objects made by non-artists.*

Blind Drawing: Another innovation in this experiment is the use of blind drawing (with eyes closed[89]) of the hand before and after the experiment (see Section 5.1.3 Figure 28). The intention was to see if these drawings changed before and after the experiment in relation to the degree of ownership over the object.

Visio-tactile stimuli: The clay objects were placed on a raised platform (see Figure 24), under which their real hand was placed. The process of tapping and stroking the object took place. This included moments of asynchronous stroking, since the strangeness of this change

[89] The blind drawing activity is a classic art school warm-up activity for drawing, which I have used many times in my workshops. Drawing without looking at the paper brings attention to drawing as a perceptual tool and as an experiment, rather than an aesthetic product.

(making a finger appear to feel numb) seemed to help draw participants into the experience. Since this was not a scientific study, the time frequency of brushing and tapping varied between the experiments, especially with the more unfeasible objects.

Manipulation and distortion of the clay: The use of clay affords the possibility of manipulating the clay during the ownership phase of the illusion. At the point where ownership was felt over the object, distortions were made to the clay, the finger was squashed or stretched, or dents are made in the clay. Often, this elicited an emotional response (as will be discussed); this is potentially similar to the effect of the hammer being brought down upon the rubber hand.

Introspective interview: A semi-structured introspective interview was given throughout the process. Evidence suggests that such introspection, in combination with an IPA approach (Section 3.2), can elicit a more intense embodied experience of the Rubber Hand Illusion (Lewis E., 2010).

Measuring ownership: In line with previous studies, the degree of ownership over the object was measured through combining the results of proprioceptive mislocalisation and a self-report questionnaire. Proprioceptive mislocalisation is measured by asking the participant to locate their index finger under the platform before and after each experiment. The self-report questionnaire uses a series of nine probing questions first used in Botvinick's and Cohen's original study (Botvinick and Cohen, 1998). The results of the ten experiments are shown in Figure 26 and 27:

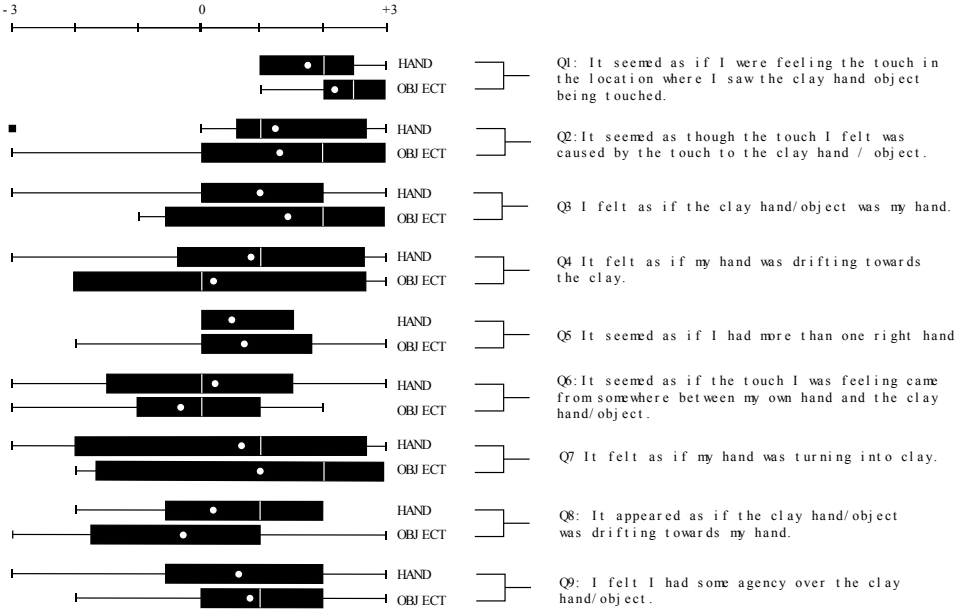


Figure 26: CHI Questionnaire results.

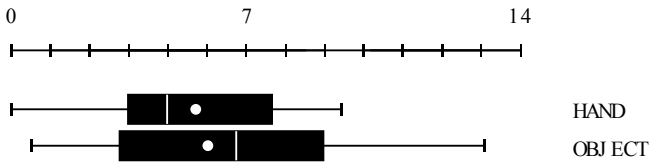


Figure 27: Proprioceptive mislocalisation (cm).

5.1.2 Discussion

Ten participants took part. Five were artists who had some experience with clay or who had arts training, while the other five were not formally educated in the arts. These workshops were audio recorded and transcribed, with notes being taken throughout the experiment. Analysis of the results revealed four themes: ‘ambiguity and transferral’, ‘confirmation and agency’, ‘residual sensations and feelings’ and, finally, ‘pre-embodiment and inversion’. These emerged in order on a timeline as participants were drawn into the illusion though the experimental process. The first phase, 'ambiguity and transferal', begins with an extended period where nothing seems to happen; participants remained silent as they tried to immerse themselves in the experience. Slowly, and after prompting, they begin talking. In most cases, participants struggled to find words that expressed the ambiguous sensations they were experiencing. The word ‘weird’ occurs most throughout the experiments; the participants had to be continually prompted to give a commentary on any sensations they felt. The transferal stage began when the participants started to experience confusing sensations. They began talking more freely, not believing the clay object was their own hand but feeling sensations which seemed to originate from the object. Something was happening, but they were not sure what. This was typified by the following statement from one of the participants:

"I don’t feel connected…but I’m expecting to feel something." (P#9)

Participants then moved on to confirm a sense of ownership, stating that it felt like part of ‘their body’ or part of ‘their hand’, or that they ‘believed' it was part of their body. Typically, they would make a bold statement such as:

"I fully feel like that is my hand." (P#1)
"I can actually feel that as part of me." (P#2)
"Yeah, I totally believe that’s my hand." (P#4)
"Wow that’s like my hand now." (P#4)

From here, a further sub-pattern started to emerge. Participants often reported a feeling of agency over the object, feeling that if they moved their hand, the clay object would actually move. For example, participants noted that:

> **"I feel like I want to twitch my fingers and that they** (the clay fingers) **would twitch." (P#5)**

When feeling strongly connected to the hand, the clay was distorted, dented, and squashed. This created strong emotional and physical reactions in four of the participants. For example, they reported feeling buzzing sensations in other parts of the body:

> **"I'm getting a shiver up the left-hand side of my body. Like you shouldn't be doing that to my body …**[referring to his hand]… **And I'm still getting the feeling now, all up my left arm and all down my neck spreading to my spine." (P#2)**

> **"Yeah feels odd. I wondered if it would hurt if you hurt the hand… That's really strong** [pressing into the den] **… I get a feeling, all the way up my arm and into my chest." (P#3)**

In both of these cases, the shiver spread up the imagined arm that connected the clay object to the body. (I personally experienced this same phenomenon later through an experiment with the invisible hand.) 'Residual sensations' were reported after the experiment. P#1 felt strong feelings over the objects after the experiments:

> **"I feel a connection with this ball now, it really feels like it's part of me now, it's so weird…I felt like a bit maternal towards it." (P#1)**

P#1 felt this experience resonated strongly with her working process, talking about how she often starts with a ball of clay when making her work. After the experiment, reading my notes via my blog, she contacted me to say how the experiment had continued to affect the way she thinks about her work.

P#6 reported sensations of their hand feeling heavier post-experiment, even though he claimed not to feel any connection with the object during the experiment. This suggests some form of unconscious embodiment with the object, even if the participant was unable to believe it was his hand during the workshop.

> **"It's weird…my hand feels heavier, like the same weight as the object." (P#6)**

P#9 created a spider-like hand with extra-long fingers. These extended so far, the ends of the fingers had to bend over the table. Reflecting post-experiment, she noted her hand still felt as if its fingertips were curled over.

> **"My fingertips feel bent over, just like the clay" P#9**

Finally, a fourth theme of 'Pre-embodiment and inversion' was noted; Several participants made comments which alluded to embodying the objects through their creation. In some cases the objects retained traces of having been made by their hands. Rather than imagining the objects as their hands, they seemed to imagine their hands on the objects. P#3 created an object which was based on the details of the back of her hand. She stated:

> **"…maybe because I know what that is,** [referring to a detail on the object #3] **I thought about that one a bit…that was the only conscious thing in my mind." (P#3)**

This seems to suggest there was some form of embodiment pre-experiment; she could embody the details that she had consciously thought about the most. Reflecting on their objects, P#3, P#4, and P#5 suggested using their hands with palm facing upwards. (The RHI is traditionally done using the back of the hand.) P#5 created an imprinted form inside her fist which was an impression of the negative space:

> **"It's a stronger sensation…but is that because the underside is more sensitive? Because I know it was the inside of the hand touching the clay it's making sense." (P#5)**

> **"I know that object is representing the inside of my hand I can see my hand on top of it." (P#5)**

> **"It's like when I'm making something, I can feel my hand moulding something, *and it feels like I'm on the opposite side of that." (P#1)***

Again, seeing traces of their own hands within the object seemed to help them embody that object. This could suggest that though intended to be unfeasible objects, they still retained some inherent relationship to the hands that made them. P#1 seemed to get feelings similar to those she experiences when making an object.

In our paper, we conclude that this experiment "demonstrates that most participants could achieve some level of connection with the clay hands they created, and a significant, often surprising connection, with an unfeasible object" and that this "challenges the body-like appearance rule" (Hall and Poliakoff, 2020:992). Some participants who described only partial ownership over the object still measured an increase in proprioceptive mislocalisation, suggesting even without being consciously aware of it, they had begun to embody the object. In making the clay objects, it may be the case that participants develop a sense of ownership over an object through the process of its creation and through handling it before the illusion. Also, although intended to be 'unfeasible', the objects often retained some relationship to the hands that made them. A recent study suggests that the objects we own have a special connection with our bodies, showing evidence that the experience of ownership of an object is based on merging an extended body image (Vizioli, 2018:online). Though this sample is not large enough to make a firm conclusion, it did seem as if those who worked with clay were more willing to form a connection with the 'unfeasible object' and seemed to have already to some extent embodied the object.

These findings (made through the initial CHI workshops, Section 4.1) informed the development of the public CHI workshop that took place at Manchester Art Gallery (Section 4.5). This workshop was streamlined and simplified, and used modules taken from the HAPS questionnaire (Section 4.4) such as the 'spontaneous sensations' experiment and the 'invisible

hand illusion'. During this workshop, participants often reacted to the initial instruction with statements along the lines of "I have no creative abilities whatsoever"[90] or "This won't work on me… this will work much better on her as she's much more creative"[91]. As that workshop progressed, I devised a scale based on my observations to categorise participants in terms of how well the illusion worked for them. This was a scale of six different kinds of believer; for example, 'non-believer' for those who could not experience and are sceptical or not surprised about this. In contrast to this are the 'desperate to believe': those who are not able experience the illusion but really want to. I also defined the category of 'super believer' for participants who readily experience the illusion with ease and to a great extent. This was combined with an assessment of the clay hands and objects based on realness and feasibility on a scale from one to six. It was not until after this workshop that I realised that what I was trying to measure was sensory suggestibility, which became an emergent theme of investigation in the later stages of the research and interconnects all three experiments (discussed in Section 5.4.2).

5.1.3 Innovations: Clay, Blind Drawing and New Experiments

In summary, the key innovation in the CHI experiment is the use of clay, which affords the following possibilities within the experiment:

Making and remaking objects: Participants can make their own objects, possibly forming a connection with the model through its creation and handling. The clay can be shaped and reshaped for each experiment and can be changed incrementally for further experiments. The object can begin as a hand-like form and then be gradually changed into more experimental, less hand-like forms.

Real-time transformations: The clay can be shaped while ownership is felt over the object; for example, pinching and squashing, or stretching a clay digit while applying pressure to a real hand. Clay objects can also be moved, bent, and flexed during the experiment. These can work in addition to the tapping and stroking traditionally used in the RHI.

[90] Personal communication, field notes, CHI workshop, Manchester Art Gallery, 10th April, 2019.
[91] Personal communication, field notes, CHI workshop, Manchester Art Gallery, 12th April, 2019.

Blind drawing: A further addition to the methods used in the original RHI experiment is the use of blind drawing before and after each experiment. The idea was to explore whether these would change as the experiment progressed. The drawings seemed to become increasingly distorted, especially when the participant's ownership over the object was strong. Drawings became wider, or thinner; on two occasions, the participants (P#1, P#3) lost count of fingers on the second or third drawing attempts. Several drawings took on elements of the objects (such as more pointed fingertips) after embodying a claw-like hand. "This suggests a potential utility as an outcome measure of the illusion" (Hall and Poliakoff, 2020:990). However, further work would need to be done to find a way of objectively measuring this across the drawings.

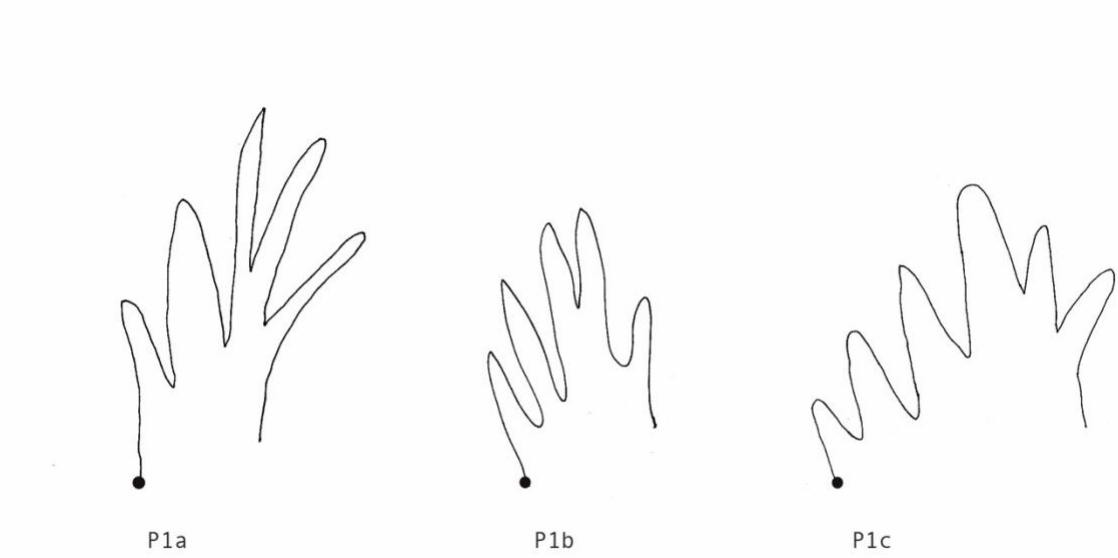


Figure 28: Sequence of blind drawings, participant #1.

New experiments

As mentioned in Section 4.5, during the public workshops a number of activities took place alongside the CHI experiment (a version of the 'invisible body illusion' and the 'alien hand experiment') which informed the development of the Autoscope (Appendix 6) and Action Intention Paradox (Appendix 7). But a number of new variations on the CHI were also developed, many of which came through observing participants at work and following their

suggestions. In working with such large group, there are often misunderstandings and experiments are misunderstood (Section 4.5). In some cases, even though the experiment was performed incorrectly, participants still believed the experiment was working; instances included feeling sensations through the table while watching the clay hand being touched, using the wrong hands[92], watching someone else's hand being touched and then sensing that sensation on their own hand, and using the palm of the hand instead of the back.

[92] I.e., using the left hand with a clay model of the right hand, meaning the tactile stimuli had to be inverted.

5.2 Ganzfeld

During the Ganzfeld experiment, participants are asked to stare into an unstructured, featureless field of light while listening to a similar homogenous soundscape (normally of white noise). In this state of perceptual deprivation, participants have been said to move into an altered state of consciousness (Wackermann et al., 2002:1365) akin to a hypnagogic state between wakefulness and sleep (Torsten et al., 2020:7). Over time, many participants begin to experience, for example, subtle anomalous perceptions, emergent colours patterns, and flashes of light.

Figure 29: Ganzfeld experiment, STOATA participant #35.

5.2.1 Methods

The standard method used to induce the Ganzfeld state is to place translucent white hemispherical domes over the eyes and stare into a bright light source. For the experiments, ping-pong balls were crafted into hemispheres that fitted around the eye socket, providing some additional peripheral cover around the sides. The hemispheres were initially taped in place, while later experiments used an elastic strap. Participants were seated comfortably while a bright light source was directed towards the face. I found that bright white 40-Watt LED bulbs provide the best spread of light across the visual field. 40-Watt Red Fire glow light bulbs used in later experiments did not spread as uniformly across the field of vision. The light bulbs were placed on modified microphone stands, making it possible to position the light precisely in front of the participant's face at a distance of roughly 30cm. Participants were instructed to keep their eyes open and to focus on what they could see within their visual field. The experiment was performed over twenty to thirty minutes. Over the course of the workshops, a number of different sounds were used. Initial experiments used white, brown, and pink noise. For the final set of experiments that took place as part of Sum Total of All the Actions (Chapter 7), a fingertip GSR sensor was used during the experiment. This data was then used to control different parameters of the sound, changing the amplitude and filtering the white noise, effectively creating a soundscape that moved across frequencies from brown to pink (see note on biofeedback Section 5.4.3). The most recent versions of the Ganzfeld experiment were performed as online workshops. Participants were sent a resource (a set of Ganzfeld goggles and instructions) though the post and the workshop then took place via video conferencing (see Section 8.3).

Figure 30: Detail from 'Ganzfeld Hemispherical Domes' instruction pamphlet.

5.2.2 Discussion

Across the workshops, a total of twenty-one participants took part in this experiment as individuals or in small groups of five to eight. After the experiment, a discussion took place in which participants reflected on their experience. The transcripts were thematically analysed to identify recurrent phrases, which were then coded and clustered into themes. In the following sections these are shown as frequency (f) of occurrence of specific words, and the percentage (%) of those using that word in that context. The analysis revealed several strong emergent themes: nature references (f7, 29%), colours (f18,59%), and patterns (f25,62%). On removing the goggles, most participants' first comments were about how relaxing and enjoyable the experience was, how they would have liked to do it for longer, and that they were only just beginning to get into the experience (P#8). Some made specific refence to feeling deeply relaxed (f4 19%), while some expressed feeling moments of anxiety and panic (f7, 14%). One stated, "I felt like I was drowning" (P#23). Participants described very mild visual effects, subtle perceptions of colours (f18 52%) and patterns (f25 62%), and patches and veins of colour:

> **"I saw Peachy reds, quite faint, then really bright orange flecks little tiny specks kept appearing when I blinked my eyes, which had a grey outside, then there were ultra-fine grey lines" (P#20).**

> **"I saw almost like lots and lots of intersecting lines, almost like window with condensation on, mainly white. White very bright purplish and orange patches coming and going, very close to white, once it started that was almost constant" (P#25).**

Two participants commented on not knowing if the eyes were open or closed during the experiment[93], and two felt like they were seeing through only one eye:

[93] This was of interest to me since it is also a phenomenon I experienced during the experiment.

"I felt like I stopped seeing in my right eye, like it had gone blind…I was staring into nothingness…then at some point my right eye switched off" (P#13).

"It did feel like a binocular fusion at one point, both eyes came together" (P#14).

" It felt like the lights were going out. Towards the end I felt like lost sense of sight, I wanted to experience this more" (P#23).

There were numerous refences to nature (f6 29%) and water (f7 19%), which reflect findings of previous studies (Lloyd et al., 2012). There were obvious links with these references and the noise used in the experiments. White noise can sound like a waterfall, while brown noise can sound like rain. Wackermann et al. also used the sound of a waterfall during Ganzfeld experiments to provide "monotonous acoustic stimulation" (Wackermann et al., 2002:1368). Three participants specifically referenced what they thought to be visual changes happening in conjunction with the sound and light, for example:

"… when I focused on the sound it was like it triggered imagination, so it was like an associated response to the noise…" (P#28).

Some participants also commented on the change of the quality of the sound:

"I had shifting colours, blues and green, I thought the light changed colour or something, kind of like tunnels, that would move if, like if I blinked, little concentric circles, tiny tiny ones, that was the main thing really, oh yeah, an oscillation in time with the sound" (P#27).

"yeah, [in response to P#27] I had that too, for a minute I thought there was like a light flickering or something. I thought it was responding. it was a bit like artex, like the fan shape, sometimes like circles" (P#25).

5.2.4 Innovations: Navigations and Central Field experiment.

Normally a Ganzfeld experiment is performed seated, or, ideally, lying down. No studies have been made on the effects of using Ganzfeld goggles while moving or navigating a space**.** I developed the navigation's experiment alongside the seated version of the experiment. This was due in part to working with larger groups (Section 4.3). It was not always possible to provide appropriate lighting for each participant, or, in some cases, to have a room to work in. Therefore, in these situations I took advantage of the different spaces, asking participants to pair up for Navigations and Central Field experiments, (See 4.2.4 and Appendix 8), and take it in turns to be physically guided by the arm, or to follow a string threaded among the trees through a space whilst wearing Ganzfeld goggles. In some cases, participants also listened to white noise while walking. The experience of a Navigation or Central Field experiment is quite different to the Ganzfeld in that the perceptual deprivation is countered with what begins to feel like a heighted awareness of nonvisual senses. Participants are forced to become more reliant upon the sense of proprioception, as well as the feeling of the ground, the textures under the feet, the temperature, the movement of air, sounds, and smells. Without visual details, there is increased awareness of the overall quality of light, including its volume and colour.

In the most recent navigation experiments, participants were asked to draw perceptual maps of the journey they had just undertaken, marking the route and various sensory experiences along the way. The maps reflect the degree to which the participants misperceived distances and the complexity of the movements. For example, P#29 believed she had remained inside the gallery[94] (a small space) for the entirety of the experiment, when in fact she had been taken outside of the gallery and walked around a larger space. The navigations have the effect of 'making strange' and can potentially enhance awareness of an otherwise familiar environment (see Appendix 8).

[94] Proximity residency, Islington Mill project space, Manchester, 2019.

5.3 Mirror Gaze Experiment

During the mirror gaze experiment, participants are asked to stare at their own refection in a mirror in a nearly dark room. The participant is instructed to fixate on a central point within the reflected image, in which a faint silhouette of their head is visible. Participants are warned in advance that they may experience anomalous perceptions. In this state of partial sensory deprivation, the brain struggles to make sense of the information it sees. Forms and shapes begin to emerge as if from nowhere. For many observers, these develop into vivid visual hallucinations "monsters, archetypical faces, faces of relatives…and animals" (Caputo, et al., 2012; Bortolomasi et al., 2014). This illusory phenomenon is known as the 'strange face illusion' (G. Caputo, 2010).

5.3.1 Methods

The MGE (Figure 31) builds on methods described by Giovanni Caputo (Giovanni B. Caputo, 2013). A key innovation to this experiment is the use of an infrared light (7) to illuminate the subject (3), which allowed filming through a two-way mirror (2) using a night vision camera[95] (1), meaning the experiment could be monitored in real time[96]. The footage was relayed to a screen outside for observation. Over the course of the experiment, sweat response was recorded using a GSR sensor (6), with the aim of using this as a way of documenting the experience, feeding back into the experiment to see if this affected the experience of the illusion. The GSR was used to modulate the frequency and amplitude of the sounds and to control flicker rate of an LED[97] (4). As mentioned earlier, these experiments were not performed in laboratory conditions. In some cases, light leaked into the experiment, and some participants noted how this change affected the experiment, which again suggested that modulating light levels during the experiment might create more hallucinatory effects.

[95] To make an infrared camera, I hacked my HD web camera, dismantling it and removing the infrared filter placed over the CCD sensor (see Section 5.3.3).
[96] This affords a potential real-time monitoring of facial expressions and eye tracking in future projects (see Section 5.3.3).
[97] Discussed in Section 5.4.3.

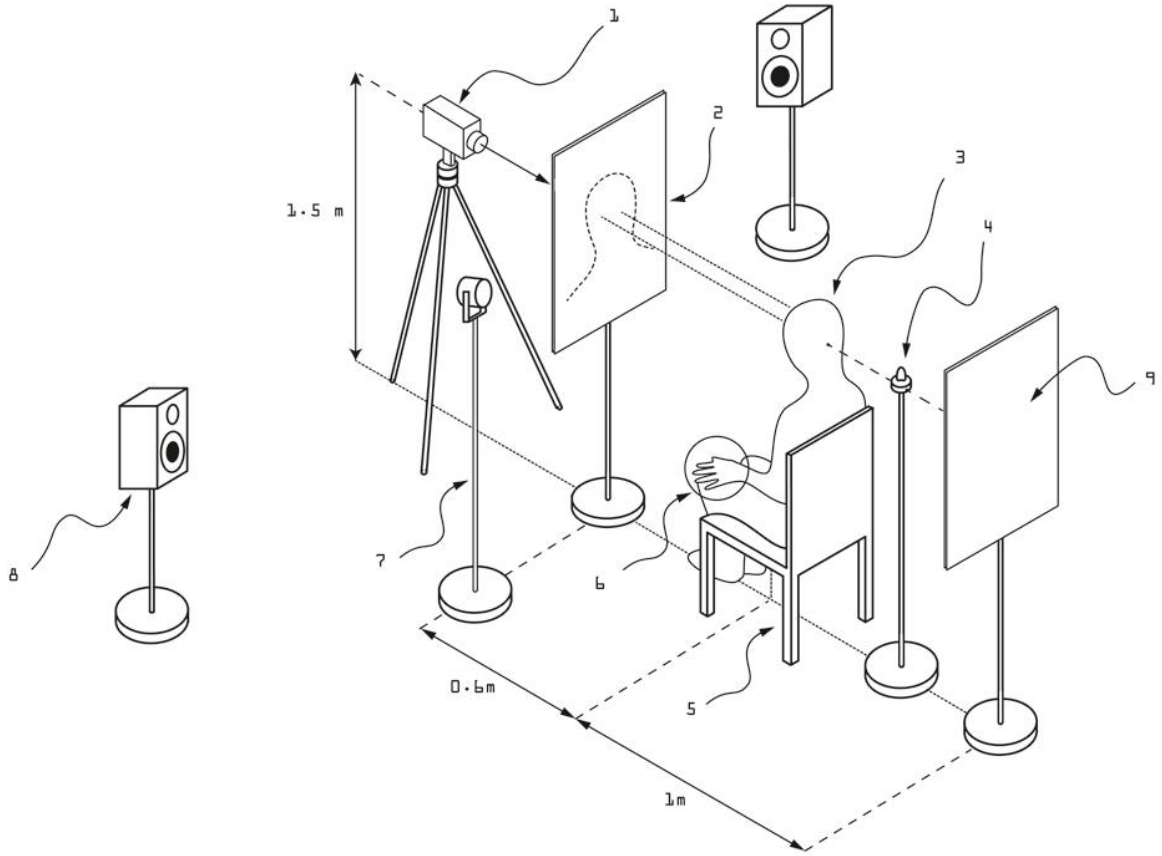


Figure 31: Mirror Gaze Experiment: Night vision camera (1) Mirror (2) Seated participant (3) LED (4) Chair (5) Sensors (6) Infrared LED spotlight (7) Speakers (8) White screen background (9).

The MGE took place through workshops with small groups as well as through other workshops with single participants in the studio (see Section 4.3 and Chapter 6). The experiments that took place at Venture Arts and MSP made use of a black-out booth (Section 4.7 and Appendix 5). Both of these workshops used the IR camera setup. For the Venture Art workshop, participants used a note pad on their lap to write down their experiences as they happened. This, however, proved quite distracting and the resultant notes were not particularly enlightening; however, it did give a timeline of specific phenomena which could be linked with the video footage in conjunction with the detailed accounts given in the post-experiment interviews.

5.3.2 Discussion

In total, across these different formats, twenty-one participants took part. After each experiment, semi-structured interviews took place. A qualitative analysis and thematic coding of the interviews revealed a number of emergent themes: continually changing forms, morphing moving and drifting, sinister faces, scariness, sound and light effecting what was seen, an aura or glow, imagination, and finally, the brain. Overall, most participants enjoyed the experience and found that the illusion manifested quickly. However, one (P#28) had to leave due to anxiety on account of the "sinister and dark" nature of what she was seeing. The experiment is also longer than Caputo's original (which lasted seven minutes), the reason for this was to see if illusory experience evolved further over this time. However, two participants stated that they either got "bored" (P#21) towards the end or had "seen everything they were going to see" (P#30).

The strongest theme was of **'continually changing forms'** (f30 94%) often linked to **'morphing moving and drifting'** shapes within the face (f19 38%). Participants made statements such as "my face felt like plastic" (P#19) or "it was like a sea of mud moving across my face, blobs and shapes drifting, continually drifting in and out of focus" (P#33). The second strongest theme was the perception of 'sinister' elements (f31 50%); one was a face with "vampire like teeth" (P#21). Others reported "ghoulish" (P#30) faces; this was sometimes linked to a notion of 'scariness', as in (f6 22%) "I was scared of what it might do" (P#30). Some referenced their heart beating faster (f8 16%) and having to focus on breathing. Furthermore, these faces were sometimes assigned a distinct 'otherness' (f28 33%). "You start seeing a face that isn't yours, is not your face" (P#38) or "It was like sitting opposite a real person" (P#30). Several 'animal-like faces' were perceived, such as a lion, a Pokémon and an ape-like face, and the face of Darth Vader.

Taking part alongside some of the participants, I noted that many of the emergent themes resonated with my own personal experiences of the illusion. I noticed subtle auditory hallucinations, some of these related to the participant; the sound of humming, quiet chuckling, cat-like mewing (in each case participants denied having made sounds or moved), as well as other microtonal qualities in the sound. I also perceived a synchronicity with the

visual waves of movement that seemed to be linked to the sound. As mentioned earlier, it was difficult to reproduce this experiment in scientifically-controlled conditions. It was not possible to fully black out the studio; similarly, the workshops took place at locations where it was difficult to create a blackout environment. In one case, a living room was briefly illuminated by passing cars. However, in each case there was a comment on how the visual phenomena seemed to react to correspond with change in light.

> **"Suddenly my own face, I could see it clearly, and it looked like a mask, it looked incredibly vivid and odd" (P#39).**

> **"There was a snow, a visual noise like the sound" (P#21).**

As mentioned earlier for the Proximity workshops (Section 4.7) I created the mirror gaze box, a portable blackout space, in an attempt to control the light – but this failed to be entirely light tight meaning that light leaked on occasion. In one case this led to an associated response in the visual experience:

> **"There was a moment where I couldn't really see anything, then all of a sudden, the background went lighter…Different expressions, swirly expressions, and the mouth moving, as if someone's mouth was open" (P#30).**

However, participants made only occasional yet specific references to sound affecting what was seen (f7 11%); for example, the "watery quality" (P#21) of the sound was linked to the imagery that they perceived as being "grainy like the sound" (P#22). In one case "the sound seemed to make it darker" (P#20). This element of flickering light will be used in future iterations of the experiment.

Reports of an aura or glow (f17 39%) occurred, e.g. "there was an outline of a light that instantaneously burst forth, like an outline of my head that was a lot brighter than it had any right to be" (P#25). The colours of these auras were mostly black and white, with only three reports of colours: blue static, purples, and orange. Across the group, there were other comments on how light in the room may have affected what they were seeing.

Further experiments

After this initial work, eleven further workshops took place (Section 4.7) using a specially-constructed blackout booth, in this case entirely light-tight. This experiment used an updated method also based Caputo's study (G.B. Caputo, 2019). This employed a button which was pressed when participants experienced a change in what they were seeing. During the workshop at Manchester Science Park some participants noticed a coalescence between the flickering light hallucinations they experienced [98]. This experiment ultimately informed the workshop edition 'You Are the Object of Your Own Observation' (described in Section 8 and Appendix 4). As was outlined in the introduction to this chapter, the work which emerged through this artistic research process is, in a sense, designed for chance, and as such, these serendipitous incidents informed the development of a reactive sound and light component to the experiment (Outlined in Section 5.4.3).

[98] Personal communications, Manchester Science Park workshops, 11th February 2020.

5.3.3 Innovations: IR Camera Light and Sound

As with the Ganzfeld experiment, I used GSR data to feed back into the experiment and modulate sound. I also used the GSR data to modulate the brightness and flicker rate of an LED (see Section 5.4.3). The most significant innovation in this experiment is the use of an infrared camera behind the two-way mirror (Figure 31 and Section 4.7). This meant that in complete darkness, the subject could be illuminated using an infrared LED light source. This enabled real-time monitoring and video analysis using FaceOSC (Kogan, 2016) and other opensource face tracking applications[99] which can capture minute facial expressions. This data can be captured and sent via 'Open Sound Control'[100] (OSC) and can be used to feed back into the experiment, (light or sound). Figure 33 shows a screenshot from FaceOSC which captures specific data streams for movements of mouth, nostrils, head tilt, etc. which can be used in Pure Data (PD)[101]. I also experimented using Isadora[102] to perform basic video analysis, such as monitoring movements using the difference filter (see Figure 32)[103]. I hoped to recreate this experiment using BEAM Labs' eye-tracking facility. This could give details on specific gaze direction and frequency of micro-saccades during the illusion. Unfortunately, due to the restrictions imposed by coronavirus it was not possible to fully realise this element of the research (see Figure 34).

[99] See https://facetracker.net/ [Accessed on 9th October 2020].
[100] Open Sound Control (OSC) is a protocol for communication among computers, sound synthesizers http://opensoundcontrol.org [Accessed on 15th September 2020].
[101] Pure Data is an open-source visual programming language (Puckette, 2021).

[102] Isadora https://troikatronix.com [Accessed on 15th September 2020].
[103] Which monitors changes in pixels between frames.

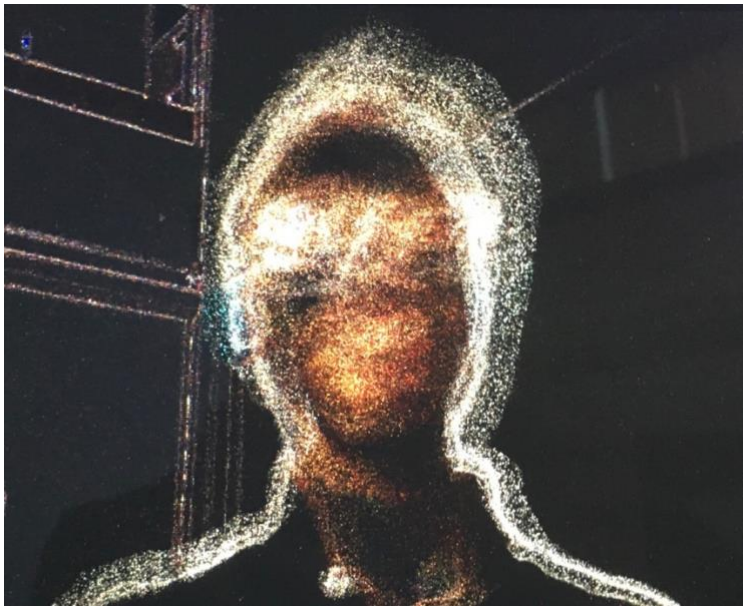


Figure 32: Screen shots: Video analysis using Isadora.

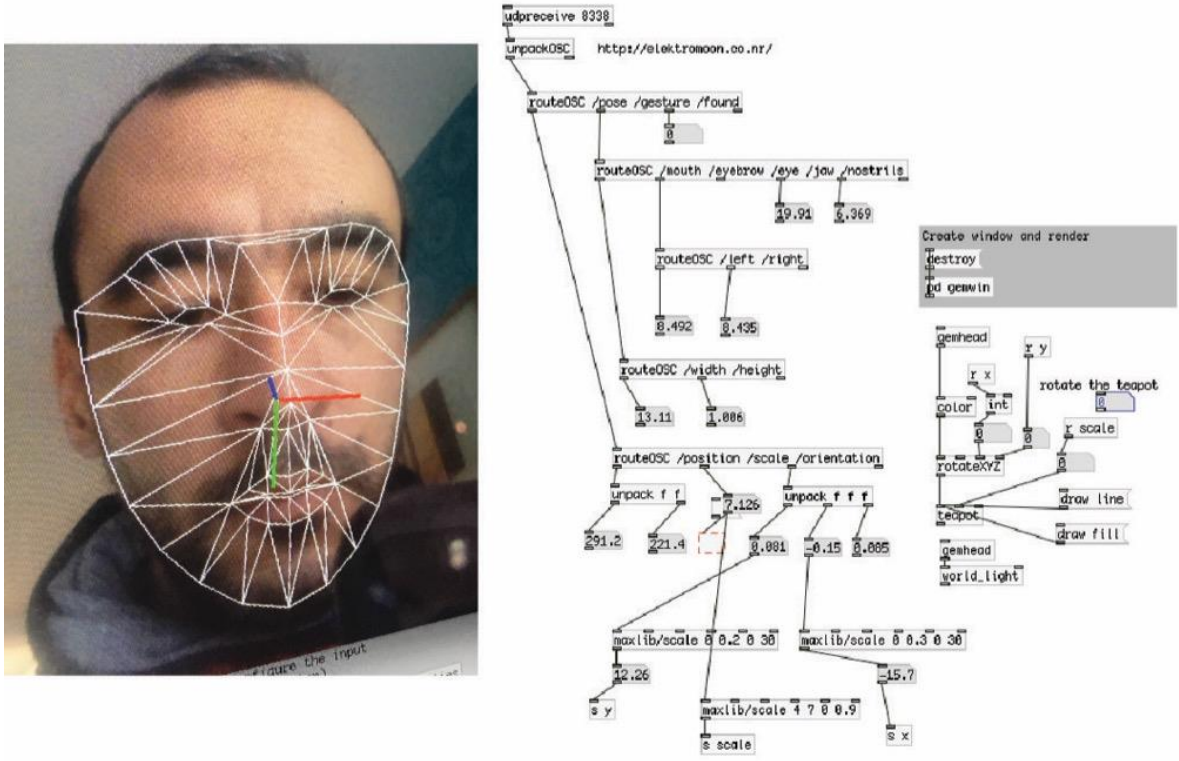


Figure 33: Screen shots: FaceOSC communicating with Pure Data.

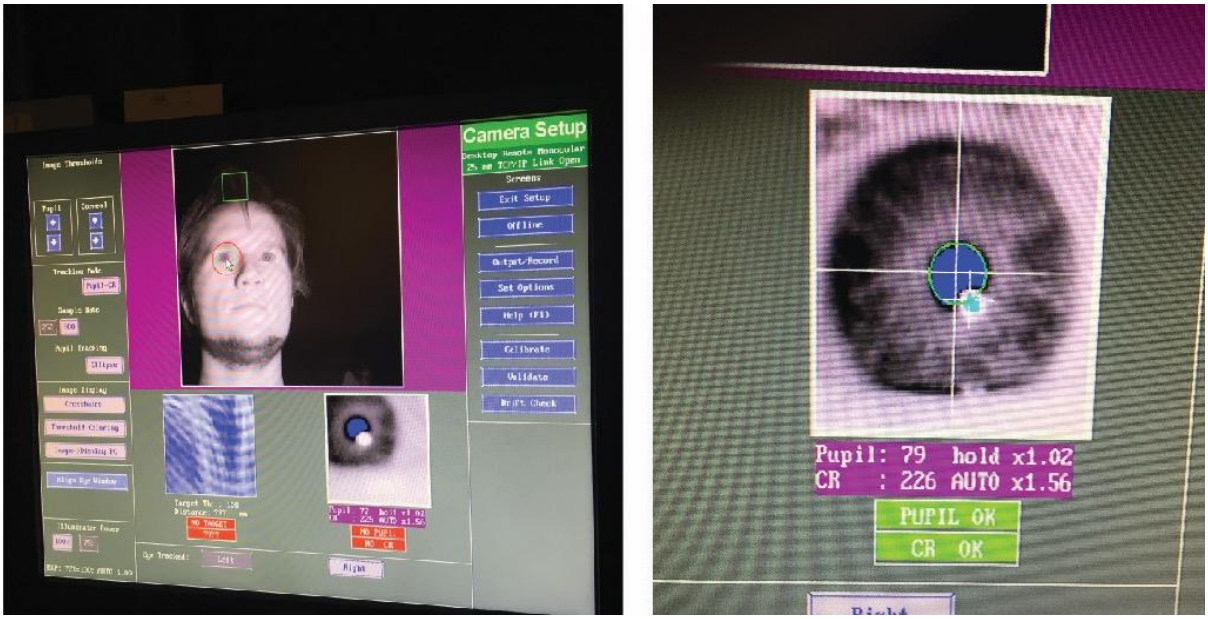


Figure 34: Screen shots: Eye Tracking BEAM Lab.

5.4 Interconnections Between the Three Experiments

Each of these perceptual illusions, reimaged through the lenses of artistic research as workshops, produces a frame, an experiential parameter completed through experience. The workshops operate as 'experience machines' (Eliasson, 2015:online) in which we become the object of our own observation. Through the workshops these experiments are re-framed as creative spaces, upon which the brain plays out a unique performance. Each experiment provides a blank perceptual canvas: malleable clay, featureless white space, or an ambiguous blank silhouette against a backdrop of noise. Clearly, the CHI stands apart from the Ganzfeld and MGE, but procedurally speaking, they have similarities in that stimuli is given. This leads to a period of transferal — a drift into the illusion — followed in some cases by a period of illusory experience. The visual experiences of the Ganzfeld and MGE are articulated with ease by participants, whereas the weirdness of the sensations experienced during CHI are more difficult to articulate. As one participant of the CHI workshops said, "I don't have words to explain what I'm feeling."[104]

In both the Ganzfeld and MGE, some participants reported that the visual experience was related to or affected by the sound. This is supported by research published during the course of this study, which shows a relationship between specific quality of sound and the visual phenomena experienced during the Ganzfeld (Schmidt and Prein, 2019:2). Other studies on sensory deprivation found that participants experienced a compressed sense of time during the Ganzfeld experiment (Glicksohn et al., 2017). I found that many participants commented that time passed more quickly than expected[105] in both the Ganzfeld and MGE. Furthermore, in the preliminary experiences of the Ganzfeld navigations, I found that in addition to time seeming to pass more quicky, there seemed to be a compressed perception space, as distances travelled were underestimated (Section 5.2.4 and Appendix 8). More research would be needed to make a firm conclusion.

[104] Personal communication, field notes, CHI workshop Manchester Art Gallery, 18th April 2019.
[105] Field notes, 2018-2020.

The ‘strange face illusion’ can be explained through a complex interaction of physiological and cognitive processes. Participants often report a fuzziness or ‘static’ (f13 37%), which could be explained by sensory background noise generated in the retina, resulting in a continually moving field of black and white microparticles (a phenomenon known as ‘eigengrau’ — a specific greyness reported in the absence of light) (Blom, 2010:170).

When fixating on an image, there is a tendency for unchanging peripheral visual stimuli to be gradually disregarded by the sensory system and fade away[106]. This is a useful mechanism to make us more aware of the changes in our direct environment, but in sensorial deprivation, this leads to a hypersensitivity, registering and amplifying the smallest of changes ‘in order to look for the missing signals’ (Dunning and Woodrow 2011:3). In both the Ganzfeld and MGE, these emergent forms are periodically reset and refreshed through blinking and continual minute involuntary eye movements (micro-saccades [107]). This may further explain the flowing, drifting waves of visual effects in both the MGE and Ganzfeld. Humans are hardwired to pick out familiar shapes and have a propensity to identify patterns in randomness or to see faces in inanimate objects (pareidolia). Michael Shermer uses the term ‘patternicity’ to define a "tendency to find meaningful patterns in both meaningful and meaningless noise" (Shermer, 2008:online), describing humans as pattern-seeking machines. In the MGE, it is possible that these emergent ambiguous forms are then assigned and re-mapped to features of the face, causing the continual morphing and the perception of distorted and strange faces. Caputo suggests that the illusory phenomena experienced using the MGE are not just a result of our perceptual process, but that they are affected by the participant’s beliefs and subconscious thought processes:

> "Strange-face illusions may be the ‘projection’ of the subject’s unconscious contents into mirror image on the basis of somatic/motor mimicry and contagion. Motor mimicry and emotional contagion can operate through the feedback produced by the mirror within the observed/observing subject." (G. B. Caputo, 2019:10).

[106] See also 'troxler fading' https://www.illusionsindex.org/i/troxler-effect [Accessed on 14th March 2021].
[107] Micro-saccades are very small movements of the eye.
https://www.sciencedirect.com/topics/neuroscience/microsaccade [Accessed on 14th March 2021].

Using the IR video camera, it was possible to see facial expressions. Participants' initially blank expressions often developed into a smile or frown, the head tilting just slightly or the gaze moving[108]. Several participants in the MGE report moving their faces to see how it affected the illusion or feeling a need to adopt the same expression (P#24). 'Motor mimicry' is the tendency we have to unconsciously mimic the body language of others, and this in turn helps us to recognise emotions and feel empathy towards each other (Prochazkova and Mariska, 2017:100). The following sections briefly explore 'mindfulness' and 'imagination' in terms of illusory experience.

5.4.1 Mindfulness and Illusory Experience

As was discussed in Chapter 4, as the workshops evolved, they incorporated more elements of mindful preparation. These were used in a similar way to the icebreaker or warm-up activities that I would traditionally use to initiate a workshop. For example, the spontaneous sensations experiment (Section 3.4) was used as a preparation for almost all workshops, while RMP 4 onwards used an eyeball-based ATM exercise (Section 4.6 and Appendix 11) to prepare the visual field. This ATM activity is delivered in similar way to a verbally-guided meditation. The most recent iterations of the workshop editions (described in Chapter 8) used a shortened version of the ATM in conjunction with the spontaneous sensations experiment. And so, these workshops felt less like a recreation of a scientific experiment than a guided experience containing an experiment.

But what are the parallels with the phenomenology of illusory experiences and those of meditation? As mentioned in Section 1.4 historically the hallucinations experienced through sensory deprivation (the practices of dark retreats and mirror gazing) have been used as a method of gaining spiritual insight. During meditation, fixating on a single point within a patterned surface for an extended period of time can result in distinct pseudo-hallucinatory effects: swirling, morphing and emergent flow between patterns and shapes (Kornfield, 1979:45). Certain Buddhist meditation techniques actively use hallucinations as a means of gaining insight, while others see these as distractions (Lindahl et al., 2014:11). Furthermore, Lindhal et al. found parallels with the neurological effects of sensory deprivation and

[108] Caputo also found similar illusory effects through 'dyadic interpersonal gazing' in low light (G. B. Caputo, 2017).

meditation such as enhanced neuroplasticity, specifically "attentional and structural components of meditation serve to attenuate sensory input, which activates homeostatic forms of neuroplasticity that lead to hyperexcitability, spontaneous firing, and hallucinations" (Lindahl et al., 204:11). The potential of this research in terms of mindful practice and Somaesthtics is discussed further in Section 9.3.1.

5.4.2 Imagination and Perceptual Illusion

Following the theme of creativity and imagination as a line of enquiry across the workshops, the HAPS gradually incorporated exercises to assess imagination, empathy, and sensory suggestibility[109] (such as the 'imagine a lemon' exercise , Section 4.4). The second phase of CHI experiments that took place through group workshops (Section 4.5) provide a good example. In that workshop, after being introduced to the activity, participants often stated that they might not be 'good' at it because they were not imaginative or creative enough (Section 5.1.3). It is hard to know if this was because the experiments were performed and framed as an artistic experience, or if participants associate hallucination and illusory experience with creative thinking. It may be the case that some people perceive themselves as not being imaginative or creative and feel a need to declare this when offered the task of doing something arts-based (such as sculpting with clay). Would they say the same if asked to do the experiment with pre-made objects or rubber hands? It is possible these responses were elicited by the language used when introducing the experiments, for example, 'try to imagine this is your hand' or 'imagine you have gone invisible'. These leading statements may have had an effect on the participants' comments on their imaginative or creative abilities (as alluded to in Section 5.1). Again, this would be an interesting area for further research.

Within the Ganzfeld and MGE there is a drift or oscillation between seeing and imagining, or, as Don Ihde might say, a multi-stability (Ihde, 2012:45). In all three experiments, participants referenced the idea that 'the brain' was doing something, and that they were not entirely in control of it, stating "It's like my brain was searching" (P#38) or that they were waiting for something to happen, especially during the Ganzfeld and the MGE. Others talked about using

[109] In addition to a simplified version of the five basic personality types ('Big 5') questionnaire.

their imagination and of actively trying to see things. The relationship between imagination and empathy has been widely studied over the years (Engelen, 2011; Rabinowitz, 1984). Studies on the RHI have also proposed a link between 'empathic function' which 'enables us to simulate the observed information' (Asai et al., 2011:1). Similarly, Caputo concludes that the MGE, specifically the strange face illusion, "may provide both an ecological setting and an experimental technique to investigate affective and cognitive components of empathy" (G. B. Caputo, 2019:21). Furthermore, recent research suggests that personality type (as well as mood state) can have an effect on perceptual experience; in particular, those scoring high in the 'openness to experience'[110] have an "increased flexibility in binding of different representational elements in the brain" (Antinori et al., 2017:15) and are more able to combine mismatching sensory information. Most recently, another study on the RHI suggested there was an interplay between hypnotic suggestibility and the experience of the RHI (Fiorio et al., 2020; Lush, et al. 2020). This has been a contentious finding and seems to challenge the scientific integrity of the RHI; it has been the source of much debate within the experimental psychology community (Seth, 2020; Makin, 2020).

[110] Artists (people considered to be creative or imaginative) often score high in the openness to new experiences vector https://openpsychometrics.org/tests/IPIP-BFFM/ [Accessed on 4th April 2021].

5.4.3 A Note on Biofeedback

Through the course of the research, I experimented with using a GSR sensor to measure responses during the experiments. In the later stages of the research this was used this to control sound and light to create a system of feedback between the illusory experience and the emotional response of the participant[111]. As was mentioned in Section 5 previous work using the RHI paradigm have shown a spike in galvanic skin response when a shock is applied during the illusion. Through this research, participants reported strong emotional reactions during the experiments. These include changes and hairs standing up on the neck buzzing in the in the arm during the CHI, breathing and perceived increases in heart rate during both the MGE and Ganzfeld. This idea was not fully implemented until the final stages of the research (Section 4.7) with the addition of a button which was pressed as a means to record incidents of illusory experience (Section 5.3.2). The following section gives a technical outline of the system.

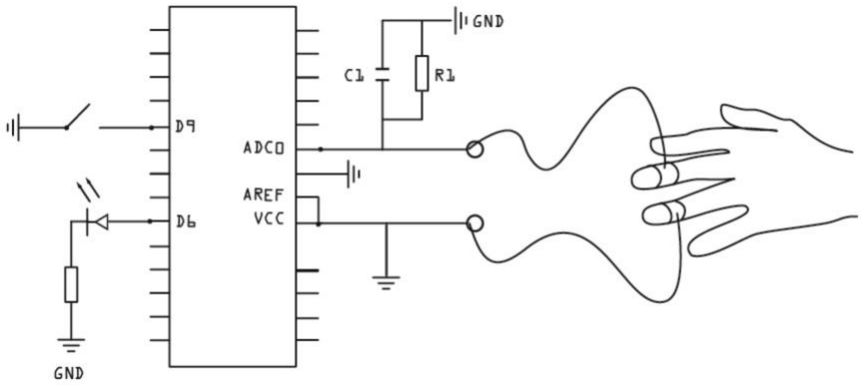


Figure 35: Schematic diagram / GSR sensor, push button and LED.

The GSR data was captured using the 'Grove GSR sensor'[112] in conjunction with an Arduino using Firmata protocol (Arduino, 2017) which was then processed using Pure Data (PD)[113]. The GSR data is used as a control signal in PD to modulate and filter white noise, which resulted in a sound scape akin to wind or waves. This same signal is used as an output to

[111] An idea explored previously in the practice (see Section 1.5 and Appendix 9: Fish-Brain-Machine).
[112] The Seed Studios website also provides the basic code for using the sensor (Seed Studios, 2021).
[113] Pure Data is an open-source visual programming language (Puckette, 2021).

control flicker rate and brightness of an LED. Figure 35 shows a circuit for the GSR sensor and push button used during the MGE. An application was developed[114] which records the GSR data and incidents of button pressing. The application is made accessible to workshop participants via a download link and runs on the desktop and renders the data to the screen in real time and recorded to a CVS file for later use. This system will be implemented through future workshop editions (specifically 'You Are the Object of Your Own Observation' see Appendix 4). Through the analysis of this data, we might hope to see a connection with GSR and incidents of hallucination (see Section 9 Further research).

Download Link http://antonyhall.net/blog/gsr-application/

[114] Working in collaboration with Chris Ball (see also 'Electronic Taste Perception' Appendix 10).

5.5 The Problem of Documenting Experience

This chapter has shown how analysis of the experience revealed patterns and interrelationships between participants' experiences that would have been otherwise invisible through my practice. In many ways, this analytical approach also provided me with as much insight into my own working process as it did to the participants' experience, making me aware of gaps and failings in my working process. In listening to the interviews, I evaluated my own interview technique, and reflected on the value of leaving space and asking questions that enabled participants to talk about their own experiences. For example, in retrospect, some participants could have been pressed on specifically what 'shapes' they saw or precisely what 'patterns' they saw. Despite this, a huge amount of data was collected, and new questions were raised which are worthy of further scientific and artistic investigation.

Chapter 4 proposed that the workshop, as visioned through an expanded art practice, could be understood as a form of art. Therefore, the data collected through the workshops, its analysis and presentation (as graphs and charts) should also be considered an integral component of artwork[115]**.** Through this research, I began to develop a further utility of this material as 'expanded documentation' — which both evidences the work's occurrence and provides insight into its experience (an element of experiential art and performance that traditionally defies documentation). Such expanded documentation would serve not just to evidence or document the occurrence of the artwork but also to convey something elemental and provide insight into the experience. For example, Figure 36 (a work in progress) shows the incidents of button pressing[116] during the MGE. It illustrates how P#52 had many more incidents of illusory experience than P#51. This chapter (specifically sections 5.1, 5.2 and 5.3) also serves as expanded documentation of the work. The problem of documenting experience is entwined with similar issues of documenting performance art. Standard modes of documentation — the recorded footage, interviews, and resulting transcripts — all fall short on their own (discussed in Sections 6.2 and 7.3).

[115] The artist Hans Haacke collected data through his exhibition 'Visitor Profile' and used respondent data to create a series of graphs and visuals.

[116] Note that an updated system has been created for the most recent iteration of the work (as was mentioned in Section 5.4.3) which can automatically log incidents of button-pressing in conjunction with galvanic skin response.

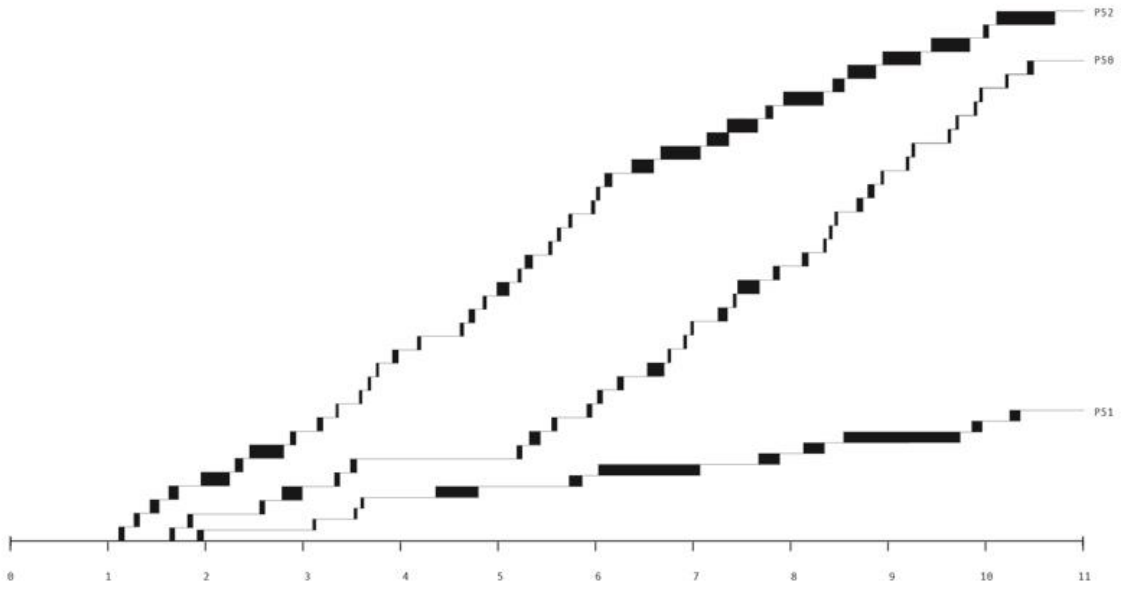


Figure 36: Mirror gaze experiment / Time vs incident and duration of button pressing.

5.6 Summary

Section 1 summarised how the practice was informed by scientific texts and books, which formed the basis for a series of works over several years. Upon reflection, I can now see how these texts acted as scores that were reperformed. The artworks created were not rudimentary recreations of the experiments; they used new technologies and whatever other materials were to hand, to make my interpretations of those experiments[117]. Chapter 4 outlined how workshop plans and the HAPS work as instructional scores guiding my interactions during the workshop. Similarly, this chapter has shown how the materials provided in the scientific literature regarding the MGE, Ganzfeld, and RHI have worked as scores within this research and are parameters that have guided the work and catalysed new ideas. This chapter has given an in-depth account of the methods and the participants' experiences; the analysis of these phenomena identified patterns and connected lines of enquiry across these three experiments. This material then has the potential to be used as a score by others who wish to recreate and build upon this work. Chapter 8: Workshop Editions

[117] As mentioned in Section 1.4, the Tabletop Experiments project was inspired by scientific texts from the late 1800s. For example, the experiments described in Soap-Bubbles (Boys, 1986) used tuning forks and slide projectors to create vibration in soap films and project these at a magnified scale for the audience. I re-created these experiments and combined these with new technologies: digital audio processing, digital video, and electromagnetic transducers.

explores how these materials work in conjunction with the instructions and resources. In the following chapter, the idea of the workshop as art is explored in more detail.

6: Workshop as Art

Thus far, I have demonstrated how certain scientific experiments were re-created through workshops and how employing new methods enabled deep insights into the experiences of the participants and the practice. This chapter addresses the idea of the 'workshop as art' that emerged through Chapter 4. This chapter will demonstrate what comes as a result of this reframing, and how this might work to further draw insights on the subjective experiences of perceptual illusion. In using the HAPS as a score, performative aspects have also been revealed within the work, suggesting connections with procedural or instructional art. This chapter also attempts to define parameters and create a definition of the workshop as art.

6.1 Experience and Experiment

Throughout this thesis and the wider practice, multiple references are made to ‘experiments’, sometimes in the titling of the work[118], or language used in invitations, and the descriptions of the workshops. The use of term ‘experiment’ (despite its dualities with the notion of experience outlined in Section 2.2) presented a number of issues depending on which context it was used. A potential ‘consumer’[119] of this work might ask, what does the participant get from this experiment? Are participants simply guinea pigs being used to gather data? For example, the RMP 3 workshop (Section 4.6) was devised in collaboration with Foundation for Art and Creative Technology (FACT). However, FACT was reluctant for a 'researcher' to gain access to their audience purely for the purposes of research, e.g., to conduct experiments. Rather, they wanted to offer their audience a ‘co-creative experience’ that would benefit the participants as well as the researcher (personal communications). Thus, the workshop, then framed as experiments and research, was never realised as part of the official public programme[120]. At the time, this felt like a failure of the work or the communication of it, but this incident highlighted an important issue and, in turn, influenced the direction of the research. As has been alluded to in Chapter 1, the practice adopts the appearance and language of science and experiments[121], collaging and layering multiple ideas together.

[118] Titles of works often included the phrase ‘experiment’ for example ‘Experiments with Soap Bubbles’ (2005). Each further showing of the work is numbered based on its iteration, for example ‘Enki Experiment no.4 (2013).
[119] A viewer of the work, a curator, a potential participant.
[120] Rather RMP 2 (Section 4.6) occurred independently, with some support from FACT at LJMU.
[121] More commonly and almost always when doing a workshop, I get asked if I am a scientist rather than an if I am an artist.

However, this is a subversion of the original, a 'détournement'[122], which, though it conceptually and visually mimics a scientific experiment, is not. The workshop is a carrier for that which is brought forth through the experience of the work. By enacting these scientific processes and methods, the medium (the workshop, the experiment, the experience) becomes the message; it is the work, not just a tool of research. Marshal McLuhan uses the metaphor of electric light bulb as a demonstration of this concept (McLuhan, 1964); as a medium without a message, it is the light bulb which enables us to receive the message contained within a printed text, which is also another medium in itself. What happens if we replace the metaphor of 'light bulb' with that of 'experiment'? An experiment, like a light bulb, contains no message in itself, but it transforms an environment through its presence. The presence of the 'experiment' has an effect, in that it changes expectations, and therefor behaviour. And, like the light bulb, an experiment also has illuminating qualities, enabling us to investigate phenomena that might otherwise remain invisible.

Framing the workshop as an artwork, therefore, has a different effect to re-creating an experiment through a workshop. For example, the later iterations of the CHI experiments were undertaken in public spaces framed in the context of an art gallery (Section 4.1). Participants stumble across workshop in the same way they might have a chance encounter with an artwork. In light of this, later iterations of experiments were framed as art workshops (Section 4.5). This is again reminiscent of McLuhan's idea that "the content of any medium is always another message" (McLuhan, 1964.46). The workshop acted as a carrier for the experiment, which in turn became a carrier for experiences.

6.2 Performance and Performativity

My presence within the work and the use of instructions as scores (alluded to in Section 4.8) hint at a performance-like, or, more appropriately, performative dimension of the work. While there are clearly performance-like qualities to the workshop, I wish to avoid fully aligning the workshop with performance art. However, since performance art shares similar problems, in terms of documenting experiences and ephemeral events (as mentioned in

[122] Détournement, from French meaning "rerouting, hijacking" is a phrase associated with the situationists and Guy Debord http://www.bopsecrets.org/SI/report.htm [Accessed on 4th April 2021].

Section 5.5), it is useful to explore this fertile ground. Paul Johnson develops a notion of 'science/performance transformation' to examine the process by which science is transformed though performance in its re-framing, assimilation and appropriation (Johnson, 2014:136). Johnson uses 'intercultural performance theory'[123], specifically Pavel Pavis's hourglass and mill model (Pavis, 2003), to illustrate a process by which an information form, a 'source culture' (such as science), passes into another 'target culture' (such as art) via a series of filters and a mill, before finally being presented to an audience (see Figure 37).

A problem with the hourglass model is its mono-directionality; it needs to be inverted to facilitate movement in the opposite direction. The expanded practice model (as was defined in Section 3.3) is similar to the hourglass model, showing a process of filtration and transformation within the melting pot (the mill) of the practice. However, unlike the hourglass model, the expanded practice model (Figure 38) illustrates a cyclical collaborative process between the source culture (a) and the practice (b), as well as the target culture (c). Interface objects (IO), workshops, and artworks mediate an oscillating interchange between multiple target cultures and sources (A and C) via the practice, imposing an osmotic pressure, or productive tension, with transformative effects, forcing elements back to the source culture (A), through collaboration (AB), and vice-versa.

[123] Intercultural performance theory relates to performance that intentionally incorporates elements of performing traditions from disparate cultures (Chang, 2010).

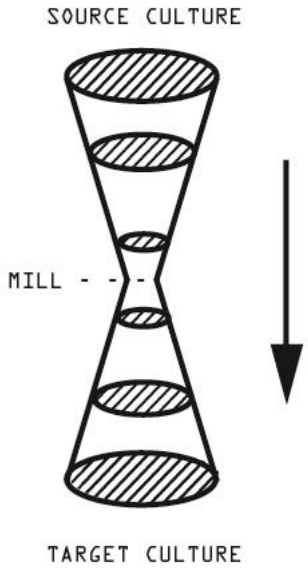


Figure 37: The hourglass and mill model, which illustrates a process by which material from a 'source culture' passes into another 'target culture' via a series of filters and a mill, before finally being presented to an audience.

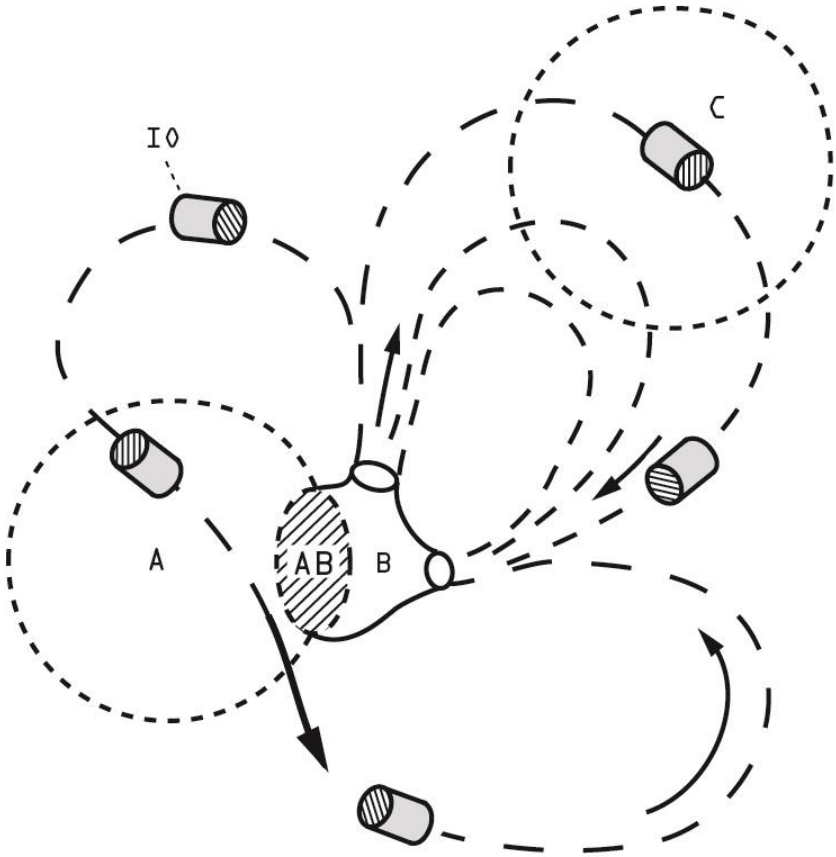


Figure 38: Model of expanded practice. Expanded art practice is a cyclical process, which 'mediates' an oscillating interchange between multiple target cultures and sources (A, B and C) via the interface object (IO), in doing so imposing an osmotic pressure or 'productive tension' which forces elements back to the original source culture (A), and vice versa.

The idea of the workshop as a space in which scientific experiments are performed and 'reperformed' is used repeatedly throughout this thesis to allude to the performance-like quality of the workshop and the associated problems of documentation. 'Reperformance' is a term associated with the work of performance artist Marina Abramović (Abramović and Biesenbach, 2010). The ideas is that since it is impossible to re-experience the original performance, the work should be reperformed, and in doing so the work is re-invented rather than just re-enacted. In this way, any available texts or instructions may be used as a score, thus challenging the otherwise intangible and ephemeral nature of performance art, making it open to reinterpretation and available as a 'tangible commodifiable exchangeable product open to many' (Richards, 2010:36).

Performance in the visual arts refers to a specific means of working, whereas 'performativity' is a concept which can be used to understand human behaviour. Nicola Triscott states that the "tactics of 'performing science' can focus attention on science's 'performativity': on science as a series of actions that affect the world" (Triscott, 2015:online). As mentioned in Chapter 4, viewing this research through the lens of performance art reveals the performative aspects of the work. However, Hantelmann points out that all art has a performative dimension in its ability to create its own reality, and that 'performative' is not a 'class of artwork'; rather, more specifically, it is about "creating a different perspective on what produces meaning in an artwork" (Hantelmann, 2014:3). Therefore, reperforming science in the frame of art enables an exploration of performative dimension of the experiment and the different ways in which meaning can be created through the experiment as an experience.

Perceptual illusions (when simulated through experiment) exist only as a result of process — an experiment that must be performed with specific conditions that are set in place and enacted within an environment. If the workshop is to be thought of as an artwork that is necessarily performed within specific parameters, it can also be thought of as a form of procedural art. Susanne Jaschko, writing in the catalogue text for exhibition 'Process as Paradigm', states that:

> **"Many artworks that are attributed to the genre of Bio Art transfer biotechnical methods from the laboratory into the art space, and often imply the maintenance of a process or an experiment by the artist or qualified personnel [**and therefore**]...imply the presence of the artists and their collaborators during the construction of the system and for conducting the processes. The art space thus becomes performative, a space in which the living activity, the processual experiment and the dialogue between work, artists and their audiences constitute the artwork."** (Jaschko 2010:132)

Although the work produced through this research cannot be regarded as BioArt, it is still concerned with living systems (as mentioned in Section 1.3). In presenting a perceptual illusion as an artwork, laboratory methods are brought into the gallery; these objects and equipment allude to a process in which the presence of the artist and other participants are not only implied but are necessitated. Working with perceptual illusion in a similar way to BioArt requires working with living material. It requires an understanding of behaviours of and processes: the parameters of experience.

6.3 Parameters of the Workshop as Art

I understand the outputs of the practice (both artworks and workshops) as 'interface objects': real-world interventions that function as probe-heads, iterative cycles of testing through interaction, and feedback that inform and are informed by the practice (as discussed in Section 3.3). Dismantling the interface object under the microscope lens would reveal a recursive self-similar structure which resembles the practice. Moving through an interface object, participants (including the practitioner) can interact and enter the feedback cycle. This stimulates the formation of new ideas that have the effect of changing the interface object. Therefore, an interface object exhibits mitosis-like[124] behaviour, self-replicating and evolving. The emergent data and new ideas are reabsorbed into the melting pot of the practice and undergo analysis and reform into new compound interface objects.

[124] Mitosis: A biological process of cell division and multiplication.

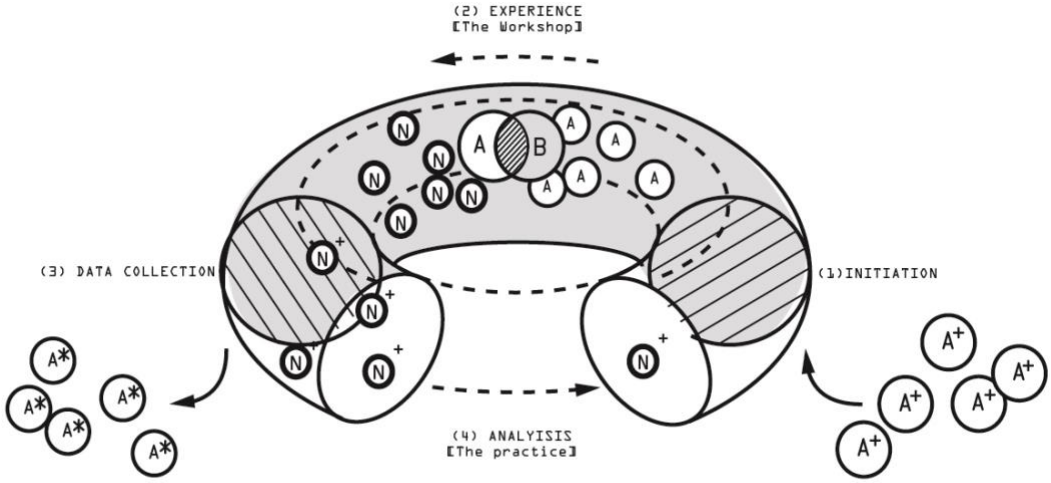


Figure 39: Interface object: Toroidal model. The body can be divided into main segments, initiation (1), experience (2), data collection (3), and analysis (4). These four elements are the organs which enable the function of an interface object.

The workshop as envisioned within my own practice functions as a simulacrum of the expanded art practice; and so, they share similar anatomical features. It is highly mobile and able to move between sites of collaboration and collaborators. It is constructed from permeable membranes which are conducive to the osmotic interchange of ideas, some of which are drawn into to the melting pot of the practice. Building on the figures shown in Section 3.3, Figure 39 shows the interface object as toroidal model; its body, like that of the workshop, can be divided into main segments: initiation (1), experience (2), reflection (3), and analysis (4). These four elements are the organs which enable the function of an interface object, a cyclical process which has similarities to those of action-research.

1: Initiation

Ideas absorbed into the practice act as nucleation points (N) which initiate an interface object. The three experiments outlined in Chapter 5 acted as nucleation points, each initiating a cycle of interface objects (workshops). Once initiated, participants (A+) permeate osmotically through the membrane of the interface object (2) and become absorbed into the experiential space of the workshop (A).

2: Experience

The experience takes place inside the event; this could be participation in a workshop or an interaction with an artwork and the artist. In this space, interactions take place between participants (A) and the artist (B). Data is collected through the experience (the workshop) by the practitioner, who is tasked with recording observations or as qualitative measures (GSR, Proprioceptive mislocalisation).

3: Reflection

In addition to this, after the experience further discission can take place, which leads to more feedback data being generated. Potentially, new ideas (N+) and new directions of research are produced through these interactions.

4: Analysis

After the workshop, participants leave (A*); the interface object now returns to the practice reflection and analysis can take place. Findings and new ideas (N+) are acted on which inform or serve as nucleation points for the next iteration of the workshop (N).

6.4 Summary

This chapter has shown that a change in conceptual perspective — thinking about the workshops as artworks — raises many more questions in terms of creativity and co-authorship within that experience. However, this chapter has also shown that it is difficult to elucidate what exactly a 'workshop as art' is, what it entails, and how these elements are any different to 'a workshop not as art'. This trajectory of thinking becomes trapped in an unyielding loop in which the notion of 'workshop as art' is periodically slung out from the maelstrom, floating in close orbit. Lacking the necessary momentum to reveal itself, it is pulled back into the swirling mass. Instead of trying to develop a set of rules or fixed definitions for what 'workshop as art' is, more progress can be made when thinking of its effects in terms of performativity, a dimension of the work made visible through using the HAPS. If we are to step out of the loop and consider the workshop from outside — its appearance, visually and ideologically as interaction made within a space — a new significance is rendered which extends beyond the workshop and its utility as research tool. This further clarifies that the participants in this research were not only participating in research, but are also integral co-authors within an artwork. As science experiments which are 'reperformed' within the context (or stage) of art, attention is moved to the significance of the workshop's occurrence — its 'happening' and 'experience'.

But why then is it important to frame the workshop as art within the context of this research? In what way does this help to draw insights on the subjective experiences of perceptual illusion?

Positioning the workshop clearly as an artwork immediately re-frames the content of the workshop, which has a disruptive effect on the scientific processes that take place within the workshop. Attention is shifted away from 'the science' / 'the experiment' and data collection and back toward the participant as a co-creator within an experience of an artwork, re-framing the scientific material in terms of imagination and creativity. The context of the workshop further implies their feedback and interpretations of the work as being of primary importance within this experience, acting to decentralise the artist as creator. Despite this

apparent disruption of scientific process, the workshops as part of a wider process can still yield outcomes that can be of interest to science (as discussed in Section 9.2).

The 'workshop as art' is a process. It is an art of prototypes, a thing or a nothing on the cusp of potential existence, never finished, an event rendered to memory. Is it, then, as is the case with performance art, that materials such as resources, documentation, and instructions are secondary to the experience? How are they to be presented? What is the role of documentation? How is the idea of the ’workshop as art’ to be communicated? The following chapter addresses these questions by presenting the workshops as artworks within an exhibition.

7: Sum Total of All the Actions.

Chapter 4 examined the development of the workshop from the perspective of the practitioner, while Chapter 5 provided an exploration and analysis of the experiences of the specific experiments. Chapter 6 outlined the reasoning behind positioning the workshop as an artwork. This chapter tests the idea of the workshop as an artwork through the exhibition 'Sum Total of All the Actions'[125], in which the workshops are presented as artworks exhibited in a gallery. This chapter begins with a visual description of the exhibition, followed by a visual analysis made from the perspective of an imaginary passive viewer[126]. The intention of this chapter is to convey an aesthetic experience of the workshop as presented within a gallery[127] and to outline how this contributes to the understanding of the experiences of perceptual illusion, as well as to further highlight the difficulties of documenting experience.

Figure 40: On the Inwardly Generated Image.

[125] Rogue Artists' Project Space, Manchester, 1st-28th October, 2019.
[126] Which is based on the feedback and incidental conversations with visitors (not participating in a workshop) moving through the gallery.
[127] I do acknowledge the art does not necessarily need to take place within a gallery. As has been shown, these workshops have occurred in many locations beyond the gallery, and in virtual contexts.

7.1 The Exhibition

Sum Total of All the Actions (STOATA) was a self-organised curatorial project in collaboration with artists from the para-lab collective. The concept of the exhibition was to show active process, works in progress, and the residual trace elements of these actions. This led to a studio-like space in which workshops could take place and experiments could be performed. The aim of this project (from my perspective) was to test the idea of the workshop as art in a gallery context, and, secondly, to gather documentation of the workshop in a gallery context. Thirdly, it aimed to explore how the workshop might be presented for an audience outside of the space of participation, and how the artefacts might work as a form of documentation. The 'Seven Practical Experiments' workshop[128] consisted of seven 'works' which were activated through the workshop and presented as artworks in the gallery for the duration of the exhibition. Instructions for each work (taken from the HAPS) were presented on a clip board near to the work, so anyone could enact the work themselves if they so wished.

The exhibition included eight works in total, three based directly on the experiments outlined in Chapter 5: 'Perception Without Object', 'You Are the Object of Your Own Observation ' and 'Unfeasible Object'. In addition to five new works, 'On the Inwardly Generated Image'[129], 'Perception Without Object — Navigation'[130], 'Permanent Possibility of Experience'[131], and 'Action Intention Paradox'[132]. Finally, 'Autoscope'[133] was exhibited but not used in the workshop.

[128] Rogue Artists' Project Space, Manchester, 18th October, 2019.
[129]' On the Inwardly Generated Image' Appendix 11.
[130] 'Navigation' Appendix 8.
[131] A variation on the navigation in which the participant is blindfolded and moved around on a spinning chair.
[132] 'Action Intention Paradox', Appendix 7.
[133] 'Autoscope', Appendix 6.

7.2 Exhibition Critique

In this section I give a visual description of the exhibition, followed by visual analysis of the work, from the point of view of a prospective viewer.

> "Entering the exhibition, a sign boldly exclaiming 'experience in progress' greets the visitor. Looking around the gallery, one can see a number of chairs and tables and a larger table, covered with sheets of paper (apparently questionnaires). Several more tables with chairs are placed around the edges of the space along with some equipment. A set of five chairs arranged in a circle occupy a seemingly empty space. Some folded blankets and mats are arranged to the side. It's difficult at first to see where the art might be. The presence of several tripods and electrical cables strewn across the floor further suggest that perhaps an installation or some other activity is still in progress, and perhaps the show is not yet open. Towards the end of the gallery, chairs are set up in a semi-circular arrangement, with large speakers placed at each side. In front of each chair, a red light bulb is mounted on a mic stand. Electrical cables trail from these, converging in a central mass of extension leads and dimmer switches. Another chair sits in front of a mixing desk; remnants of electrical wire micro-porous tape and semi-circular Ping Pong balls are scatted on the floor…As the title suggests, there are seven works here, each assembled from found and repurposed items. Wooden parts are clamped together or, in some cases, taped. Microphone stands are widely modified to hold lamps or mirrors as well as microphones, which are posited to face apparently-absent participants whose presence is suggested only by the empty chairs. For each area, a clipboard is attached to the wall; this contains the work's title as well as a series of instructions for the work's apparent use. In some cases, the forms and drawings have been produced through some previous action. The central table is strewn with paperwork; a scan across the documents shows these to be semi-completed questionnaires, forms, drawings, outlines of hands adorned with squiggles, and the word 'buzzing' are only clues to the discussions and experiments that took place…"

Figure 41: Participants using the HAPS, before and after workshop.

> "…The objects and assemblages feel like prototypes with distinct functionality — features in line with the aesthetic functionalism[134] (*Hansson*, 2005), typical of Halls practice. The use of found and cheap materials gives a sense of the unfinished. Electrical cables are scattered across the gallery floor. The works seem to have been quickly assembled, timber offcuts are clamped together, affording potential adjustment, while folding stands and trestles are used across the work. The insinuation is that at any moment these can be moved, packed away; there is something non-committal and a feeling of transience in each work. The presence of tripods and microphones suggest the live elements have taken place or are about to take place; there is a sense of potential energy or exhausted remnants – it is not specifically clear. In another corner a wooden frame, flimsy and lightweight, is covered with blackout material (the Mirror Gaze Box) is clearly made from recycled wood. Inside, an office chair is revealed, and a mirror is clamped to the frame, behind which is a web camera. The presence of several electrical and unplugged USB cables suggests an audio-visual functionality. But we are not party to the complete picture." [135]

What can be understood from these workshops as static objects? As sculptural assemblages of materials and equipment, created through a past event, they could be thought of as 'action-sculpture'[136]. Alternatively, given the presence of instructions, these objects suggest a use in some future action; potentially, the viewer can choose to activate the work, or to participate with it. In this way, they can be seen as an 'activating sculpture' (Dahlgaard, 2019). The objects also serve to decentralise the artist and to fragment ideas of authorship; the various empty chairs suggest an absence, again pointing to the participant and the experience as essential components of the work. For the audience of these workshops — the passive viewers — it is not entirely clear what they are witnessing and where the art lies. In many ways, uncertainty about how these events are art is a strength of the work; indeed, Paul Rebhan's own definition of 'perceptual art' states that the audience are sometimes not aware they are witnessing an artwork (HiSoUR, 2011:Online).

[134] In which aesthetic quality is completely determined by practical function.
[135] Reflective Journal, 11/11/2019.
[136] A term commonly used in reference to the works of artist Roman Signer.

7.3 Documentation: Performance and Performativity

The documentation of STOATA was not available during the show but instead emerged through it[137]. And as such it was difficult for visitor to the exhibition to understand the work without either participating or directly witnessing the work. The feeling for the visitor was that either they had missed the work, or that it was not yet complete. This emphasised the importance of documentation. The documentation does not only evidence the workshop's occurrence, it gives an idea as to what the experience *could* have been like. Documentation in performance art is traditionally anti-aesthetic; it is functional and utilitarian. A distinct parallel can be drawn with the hyper-functionalist documentation of scientific experiments used in scientific journals, which has an alluring aesthetic of its own[138]. In this sense the documentation serves to inform and enable future reperformances of the work.

Within the workshops both the practitioner and the participant become actors in the 'performance' of the experiment; as such, each function as a primary recording device. Similarly, the apparatus of the experiment — specialist equipment, furniture, video and sound recording devices — all become visual elements of the artwork as experienced by an audience. The performance artist Gina Pane talked about how the photographer was part of the experience of the performance, and that it was important that the documentation of the work was part of the original experience of the work. Pane stated that "it creates the work the audience will be seeing afterwards. So the photographer is not an external factor" (Auslander, 2006:3).

This exhibition was an experiment which aimed to test how the workshop might appear to a viewer when presented in a gallery and how the workshop might be conveyed as an artwork, while also exploring the performative or performance-like aspects of the work. This element of performance-likeness is most clear with the Autoscope**,** since this had a clear audience and was performed in public space; it was clearly a spectacle, and so it had performance-like qualities. But it is less clear with the other workshops in the show. The Autoscope, of all the works, was also the one that was most clearly recognisable as an artwork, I believe that this

[137] The documentation created through this exhibition forms the basis for the online PhD Exhibition (see Section 1.2 and Appendix 1-12).
[138] This idea informs the documentation and the style of the drawings used throughout this thesis.

is in part due to the video documentation being presented alongside it. Performance art is a transient and experiential art form, existing most significantly in the form of the memories of those who experienced it. As was mentioned in Section 5.5, documentation of performance art is considered secondary to the works original performance or later reperformance. This makes it a notoriously-difficult form of work to exhibit. The same difficulties are encountered when attempting to exhibit the workshop as art.

Figure 42: Perception Without Object workshop.

7.4 Summary

This section described the physical manifestation of the workshops as might be experienced in a gallery. The workshops as art objects take the form of assemblages created from the functional materials and equipment necessary to implement the workshop. This anti-aesthetic draws focus to the process and experience of the work, while at the same time evidencing the occurrence of the work. This provides a way into the work that doesn't require participation. However, through watching people passively interact with the work and the various conversations I had about the exhibition (as conveyed through the imaginary viewers' visual analyses), the work failed to draw attention or to be perceived as artwork in the way that I had hoped.

There are clearly challenges in communicating the workshop as an artwork. It appears that the ideological packaging of the workshop as conveyed through the press release and other interoperative materials, in addition to the experience of the work and its documentation, is crucially important in order to communicate the work's experiential dimension and its utility as artwork. The following chapter outlines how these issues inform the move to create workshop editions, box sets containing instructions and materials for the workshop, and certificates of participation.

8: Workshop Editions

So far, the development of the workshop structure has been discussed in Chapter 4 while Chapter 5 discussed the experiments undertaken across those workshop events. Chapter 7 identified the problems of communicating the workshop as art and identified the need for appropriate documentation, not just to evidence the occurrence of the workshop, but also to frame the workshop as art. The purpose of this chapter is to show how the workshop editions, developed in the later stages of the research, act to pull together a number of emergent lines of enquiry (detailed in Chapters 4-7). This chapter discusses the specifics of editioning workshops, the purpose of allocating a certificate of participation, and details the workshop resources.

8.1 Editioning Workshops

The idea of the 'workshop as art' (as with other forms of immaterial 'experiential art'), raises some issues around authorship and authenticity in terms of market value and as commodified experience, an idea debated widely over the years (Murtola, 2014:2). The artist workshop can similarly be seen as a commodified experience — an extension of the gallery designed to enrich the viewers' experiences and entice audiences. Reframing the workshop as an artwork also raises some interesting questions. What is that value of such a workshop? How many exist? Is it a 'multiple' experience, or a finite number, or a unique experience? In light of these questions[139] a process of titling and editioning was developed to further refine the idea of the workshop experience as an artwork. The edition process works as follows:

Each iteration of a workshop is considered a unique edition within the workshop series, for example, a workshop undertaken for a specific event on a specific date, working with a specific group. The 'Perception Without Object' workshop was undertaken with the 'Proximity' group[140]. The workshop had five participants, so this was an edition of 5 within the series. The workshop at MSP (Section 4.7) was repeated with eleven times with a single

[139] Questions posed to me by fellow Proximity Collective member, Islington Mill residency, Manchester, 2019.
[140] Object Without Perception, Proximity / CV19, edition of 5, 20th March, 2020.

participant; each was a one-to-one experience, and each is editioned as unique in relation to the specific participant[141].

8.2 Certificate of Participation

When galleries sell artworks, the artist can provide a certificate of authenticity to accompany the work, which alludes to the work's originality and the specifics of the edition. If these workshops are to be considered artwork and editions, it seems only right that they, too, should be authenticated in a similar way. For the STOATA workshop, participants were presented with a 'Certificate of Participation' after the workshop. The certificate gives a description of the work, its 'edition' number within the series, and a unique participant number (P#, also referenced in this thesis, see Appendix 14). The certificate is signed and stamped by the artist[142] and the participant, acknowledging their contribution as a co-creator and confirming the participation in the artwork. The certificate links to the documentation of the workshop through a specific web page[143] (see Section 8.4). The layout for the certificate is as follows:

[141] Mirror Gaze Experiment, edition of 11, 20th February 2020 (Section 4.7).

[142] An 'Experiments in Art and Perceptual Illusion' stamp was created for documents and editions. This was the original title of the PhD research project.

[143] All workshops are listed by date title and the edition number.

CERTIFICATE OF PARTICIPATION

This is to certify that

---------- (INSERT PARTICIPANT NAME)

Participated in the following artwork:

---------- (WORKSHOP TITLE / SERIES NO.)
---------- (LOCATION)
---------- (SPESIFIC EDITION TITLE)
---------- (EDITION NUMBER)
---------- (DATE STAMP)

Authenticity statement:
This is an authentic, original artwork which consists of the following components:

---------- (INSRERT DESCRIPTION OF WORK)

Thank you for taking part in this artwork and contributing to the ongoing development of the work. Your participation has been integral to the creation of this work therefore are welcome to reuse the resources and ideas in any way you see fit, to conduct your own workshop or experiment in accordance with creative commons 'Non Commercial Share Alike 4.0 International conditions: https://creativecommons.org/licenses/by-nc-sa/3.0/

Documentation of the workshop can be found here:

----------(INSERT URL)

Antony Hall

---------- (LEAVE SPACE FOR ARTIST SIGNATURE)

---------- (INSERT PARTICIPANT NAME)

---------- (LEAVE SPACE FOR PARTICIPANT SIGNATURE)

Your unique participant number is: #

---------- (NUMBER STAMP)

8.3 Instructional Art

The idea of the workshop as a form of procedural or instructional art was alluded to in Section 4.8 and developed further in Section 5.5, which proposed that the detailed observations and analysis of the data from the experiments can be used as part of a distributed score. This section builds on the implications of this emergent dimension of the work. The origins of art by instruction can be traced to Marcel Duchamp, while the key influence in terms of the use of the score in the visual arts was experimental musician John Cage. The Fluxus artists made use of 'event scores', which were simple instructions for performance-like events; these were often vague and left open for interpretation. Fluxus artists were interested in the reuse of materials and the DIY aesthetic, transforming otherwise mundane, everyday activities and objects into art. Fluxus art aimed to challenge what was seen to be an increasingly academic and market-driven art world. This way of thinking resonates with my own interests in prototypical 'functional aesthetics' of the workshop[144].

The existence of the instruction, or score, necessarily implies the work's potential re-creation, serving as both a document of the work's past or potential future existence and as an embodiment of the idea itself. Another allure of instructional art is the implied shift in focus from artistic ownership of the work, thus making it available to anyone who wishes to 'do it'. The meaning of the work is created through those who participate with it. Instructional art, like procedural or processual art "opposes the oppressive canon of the spectacle and instead introduces the idea of art that merges with life" (Jaschko, 2010:132). Large-scale exhibitions such as and 'Modus operandi' (Société, 2017), Do It: the art of instructions' (Manchester Art Gallery, 2013), and 'Do it: home' (Independent Curators International, 2020) show that instructional art is a medium of expression embraced by contemporary artists from a broad spectrum of practice.

The preparation for a workshop is a time-consuming process; careful attention needs to be paid to the selection of materials and equipment, often with very limited financial resources. The resources used in the workshops are not only essential components of the environment,

[144] Although not immediately obvious, the box sets make use of up-cycled, readily available materials (Ping-Pong-balls, plasticine, table legs, repurposed tech from previous projects and end-of-line jewellery boxes. They were printed at home, stamped with a DIY stamp set.

they can also serve important roles as props acting to frame the experience. The processes of organising paperwork, forms, and questionnaires during the workshop was distracting and time-consuming. However, as mentioned in Section 4.3, these otherwise extraneous processes were transformed into a creative medium and eventually became part of the work. The paperwork was held in clipboards and, when not in use, were mounted on the wall, suggesting their utility as component parts of the artwork (Chapter 7). Over the course of the research, an increasingly minimal collection of equipment was used for the workshops; each experiment was rendered down to its most basic materials and could be placed in one small box alongside the instructions. The first boxed resource created through this research was 'Ganzfeld Hemispherical Domes' (Figure 43) made for the exhibition 'Proximity' (Paradise Works, 2019). I hand-crafted a set of cardboard boxes and placed folded instructions inside (along with the Ganzfeld goggles) for the workshop.

Visually, these boxed resources are immediately-recognisable as art, reminiscent of Fluxus art (instructional scores and kits), while also strongly resembling the resources used by experimental psychologists, e.g. the various psychometric tests boxes of cards puzzles and instructional documents[145]. These objects intrigue and draw attention in a way that stacks of questionnaires and the sprawling collocation of chairs and tables do not (such as the STOTA exhibition). The resources elevate otherwise insignificant documents and materials (scattered paper, Ping Pong balls, circuit boards) from the general noise and visual chaos of the workshop. The simple act of packaging (an event which occurs around the resource) frames the workshop clearly as an artwork, yet the experience of the work is still central to it. To be clear, the resource is not 'the work'; it is an incomplete element, entwined with the experience of the workshop. It is one component of a number of materials and processes that work together to create the work. The work takes place when these materials combine within the workshop to form a specific moment of experience created with others who participate in it.

[145] A number of these can be seen by searching 'experimental psychology' in the Science Museum's archive database: https://collection.sciencemuseumgroup.org.uk/search?q=psychology [Accessed on 3rd of April 2021].

Figure 43: 'Ganzfeld Hemispherical Domes' Paradise Works 2019. Image: Anya Stewart Maggs.

8.4 The Editions

The utility making of resources, box sets, and kits was brought to light during the first wave of coronavirus lockdown restrictions[146]. This impending uncertainty necessitated a new approach. Working from home, not being able to test the work in a gallery at a crucial point in the research led to working through the medium of video conferencing. Three workshops were developed which make use of boxed 'resources' that are sent by post to participants (See Appendix 1-4). Each consists of a small box adorned with text. The wording includes the works title, description of the contents, and specific information on the edition, date and location of the workshop. The instructions take the form of a folded document placed inside the box[147]. This links to further workshop resources, documents and the virtual meeting[148]. The certificate of participation, created after the workshop, is also kept within this packaging.

[146] First UK coronavirus lockdown, 23rd March, 2020.
[147] This is formatted in the style of medicinal packaging and gives a general outline of the workshop, including tongue-in-cheek warnings of side effects such as potentially hallucinatory experiences.
[148] Although these have been designed as virtual workshops, they can easily be adapted to other formats.

The rest of the materials and equipment required for the workshop are sourced by the participants[149]. This means that for each iteration of the workshop and each site, the workshop takes a different form. The experience is completed through video conferencing and other resources, which are shared with the participants before and during the workshop. Each of these workshops can be easily adapted to work under 'normal' post-pandemic working conditions.

The resource is a not only a lasting token artefact — it also provides further potentiality of continued practice. The boxed resource sets can be thought of as a manifestation of or as an extension of the work's instructional dimension**.** The resource opens two different potentialities for the workshop — firstly, in the experience of the specific edition and secondly, in its nucleonic potential to generate future interface objects, generating ideas for new work and its potential re-creation by others. This virtual and instructional element of the work, digital documents accessed through the website, and the information conveyed through this thesis work together to make a distributed score. Each resource is accompanied by supporting digital materials. These include:

> **The workshop edition page:** This page gives instructions on how to 'obtain' or participate in a forthcoming workshop edition, when and where to take part and what costs this might incur. Since workshops are generally designed in partnership with those who participate or with those who wish to facilitate the workshop (a gallery or other institution or group), details will need to be discussed before the edition number can be settled upon.
>
> **Artwork page:** This provides background information and, in some cases, instructions, placing the work within the wider portfolio of the practice. This page provides links to documentation of the work and previous workshops. The page also gives additional insight into my working process, referencing the original research which inspired the workshop.

[149] A bit like so-called pancake 'ready mix', which requires both egg and milk for its completion.

Workshop documentation page: These pages are generated after each workshop and distributed throughout the blog. These pages evidence the occurrence of the specific edition.

These workshops constitute a personal interpretation — a re-scoring of the scientific work referenced in this thesis (the RHI, MGE and the Ganzfeld). They are nuclei around which an interface object is generated. These workshops continually retain their functionality as protypes, as interface objects, and as iterations in the continuing cycle of practice. The three limited edition workshops have been created to 'coincide' with the online exhibition occupy a display case within the gallery plan[150]. This display case represents an online 'shop' which is built into the blog (see Appendix 1).

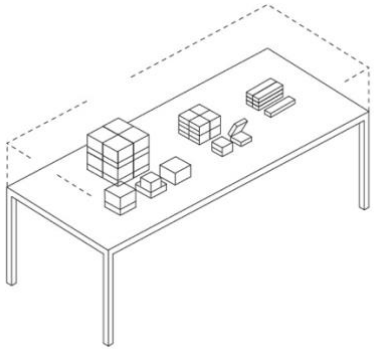


Figure 44: Display case with workshop editions.

[150] Based on the actual display case that would have been used at Rogue Artists' Project Space.

9: Conclusion

"Reality is merely an illusion, albeit a very persistent one."[151]

This thesis has articulated a research journey that has enabled insights into perceptual illusion, revealing the shimmering multi-stable qualities of our perceived personal realities. In addition to this, reflections on the expanded practice led to unexpected outcomes, emergent findings, and new directions for research. The thesis has shown how science experiments were re-created and new methods were assimilated into, and transformed through the practice; this led to new artworks and ideas for new experiments. The workshops made use of warmups and mindful practice as an initiation to prepare participants for experiments and made creative use of the questionnaires as scores. Mistakes and accidents were embraced and built upon; for example, the uncontrolled conditions of the various workshop environments led to playing with changing sound and flickering light.

The outcomes of the research are addressed in three sections. Firstly, the workshops became the artistic output of the research and led in turn to the idea of the 'workshop as art'. Secondly, in terms of exploring the subjective experiences of perceptual illusions, the research employed an innovative methodology, which was shown to be effective in pulling in-depth insights from participants (this is evidenced through the 'emergent questions and insights' and their value in relation to both science and art). Finally, a third outcome relates to the 'impact of the research' — the lasting effects on the practice and the practitioner. The following three sections will address these three elements in turn before identifying areas for future work and final thoughts.

[151] This is a commonly used misquotation of Albert Einstein which is based on sentence written in a letter to Michele Besso in 1955 "For people like us who believe in physics, the separation between past, present and future has only the importance of an admittedly tenacious illusion." (Einstein, 1955).

9.1 The Workshop as Art

In this section, I reflect upon the key finding of this research: the concept of the workshop as art. I detail its parameters and the new work it has enabled, before finally summarising its significance as a contribution to knowledge. As has been outlined in Chapter 1, workshops have deeply informed my practice and the artwork created through it. These were time-consuming projects which previously took place backstage in the practice. A crucial objective of this research was to develop a new body of work exploring perceptual illusion, which would be informed through workshops. However, through the course of the research, the workshops became the artwork and the products of the research. The concept of the 'workshop as art' was used as a mechanism which in turn helped to achieve the objectives of the research to re-frame and re-purpose scientific experiments as artworks, and to gain insights into the experiences of perceptual illusion. Reflecting on my own interactions within the workshop led to a significant change in the way I practice. This has resulted in understanding my role not just as a lead artist but as participant with others within a co-creative process. As was detailed in Chapter 8, this perspective shift in practice is represented by three practical changes to the way in which I conduct a workshop — the creation of the instruction necessarily implies the works re-creation (an invitation) serving as both document of the works past or potential existence and are an embodiment of the idea itself. The 'editioning' of the work and the awarding of a 'certificate of participation', acknowledge participants as co-authors within the artwork.

There were three key changes to the practice which acted to re-frame the workshop as an artwork: the creation of instructional scores, a process of editioning, and issuing certificates of participation that acknowledges participants role co-creators (outlined in Section 8). In the online PhD Exhibition (Appendix 1-11), I have presented eleven new works, ten of which are clearly workshops[152]. The workshops are shown in two different formats: as 'instructions' and as the 'workshop event'.

- **The instructions.** Writing the workshop plan as instructions and diagrams (scores) that are either completed through the workshop or enacted by others, represents a new

[152] The exception is the Experience in Progress badge, which was worn during some of the workshops (see Appendix 11).

way of working in my practice. Three workshop editions are presented in the display cabinet central to the exhibition as resources; packages which contain instructions and selected materials which are then activated through the workshop. In addition to these, 'Fish-Brain-Machine' and the 'Electronic Taste Perception Workshop' are presented as circuit diagrams (drawings) and instructions[153]. These works would have previously been invisible elements of the practice, experienced only though participating in the workshop, or published somewhere in the background area of my blog. These workshops are now made visible and accessible as artworks as part of the portfolio of practice.

- **The workshop event:** The workshop's placement in the gallery affords the possibility of witnessing the event in progress as a spectator. These are shown in the exhibition as objects; tables, chairs and various other equipment assembled together, ready to perform the potential; workshop. These could also be the aftermath or evidence of an event that has taken place. The online exhibition links to the documentation and evidence of actual workshop events. In a real-world exhibition, this evidence would be presented alongside the physical materials as video or photographs.

Referring to the work discussed in the Literature Review (Chapter 2) the workshops clearly served a purpose as research tools[154] which enabled insights perceptual experience. The workshops also acted as a test-labs[155] for the ideas developed through the practice. They were also 'parameter-like'[156] in that instructions are initiated, and experiences later reflected on. In positioning the workshop as art, the workshop experience became the work, co-created and completed within the mind of the participant[157]. The workshops function as 'experiencing machines'[158] — discreet environments formed by instructions and the arrangement of materials and equipment, completed through participation. What differentiates the workshop as art, from experiential art more generally is the artist's role within the work. In

[153] In the future, these could be made into resources by packaging selected materials together into a box which would then be completed through the workshop.
[154] See Section 2.3: Workshop as Research Tool.
[155] See Section 2.4 Workshop as Test Lab.
[156] See Section 2.5. Workshop as Parameter.
[157] See Section 2.6 Experiential Art / Art as Experience.
[158] Olafur Eliasson (Eliasson, 2015:online).

other words, my presence within the workshop as an artist and researcher, to facilitate the experience and collect data, which then feeds back into the experience and informs future iterations of the work (as mentioned in Section 2.6). The 'workshop as art' is a progressive, evolving, iterative entity; an interface object through which participants permeate (as discussed in Section 6.3). Participants become co-authors of the work and osmotically inform the research process and future iterations of the work. In this way, the workshop as art has similarities with socially engaged art and as a 'multi-layered participatory structure' with elements of both directed and creative participation (Helguera, 2011:15). The meaning is created through the experiences of the workshop, co-authored with the participants under the practitioner's guidance.

In summary, this research has shown how reframing the workshop as art performed as a crucial mechanism (as an interface object) within the practice. This generated emergent questions and insights[159] in addition to having transformative effects on the practice[160] (which are discussed in the following sections). As was outlined in the literature review, the workshop as art occupies a gap between the workshop in the traditional sense and experiential art. Furthermore, in conjunction with underlying interface object methodology, the concept of the workshop as art provides a dynamic framework of transdisciplinary practice optimised towards (but not limited to) science art collaboration.

[159] Discussed in the following Section 9.2.
[160] Discussed in Section 9.3.

9.2 Emergent Questions and Insights

In addition to creating a new body of work[161], one of the initial objectives of the research was to generate questions through the work that would be of interest to science, further demonstrating a utility for art-science collaboration as an interdisciplinary research model and a method for exploration. The following sections (#1-6) are based on Dr Poliakoff's presentation[162] to the BEAM Lab group[163]. In the presentation, she outlined the CHI and unfeasible object experiments before reflecting on her initial expectations listing five further 'unexpected outcomes' from the collaboration. This presentation gave helpful insights into the impact of the research from a scientific perspective. This section gives an outline of these six unexpected outcomes, to which I have responded with my reflections.

#1 Generation of New Research Questions

Dr Poliakoff's initial expectations were that the project would be an opportunity to collect data differently, create new stimuli, and create new ideas for different experiments. She noted that it was difficult to know what to expect because of what seemed like an extended exploratory phase in the research[164] before pinning down the details of the experiment. However, she went on to note that as scientists, they could benefit from longer periods of exploration before standardising things. A key outcome of this research are the new questions which relate specifically to the CHI and the 'unfeasible object experiments (Section 5.1.2). In summary, both the CHI and unfeasible object experiments challenge the 'body-like appearance rule'[165], and raise questions about how the illusion of ownership is affected by the process of making and handling the objects. The experiments also suggests a potential utility for blind drawing as a measure of ownership in the experiment. These questions are discussed in a co-authored paper (Hall and Poliakoff, 2020) published in peer-reviewed scientific journal 'Perception'. A collaborative outcome, which Dr Poliakoff has used as a teaching example for her students, which further evidences potential scientific utility of this research. Further questions which emerged through the research regarded the role of

[161] Which is also an emergent outcome of the research.
[162] Audio recording online BEAM LAB meeting 20 January 2021.
[163] This was a practice for a presentation for the Perception group, Liverpool Jhon Moors University the following week. https://www.bertamini.org/lab/ [Accessed on 1st January 2020]
[164] In comparison with a scientific study.
[165] Which states that object needs to have a body-like (or hand-like) appearance in order for the illusion to work, see Section 5.1.

imagination, sensory suggestibility, and personality type in the illusion (discussed in Section 5.4 and expanded on in Section 9.2.1).

#2 Innovative Solutions to Experiments

Dr Poliakoff noted that "…the solutions are technically impressive but were also creative in the way that they solve issues of how to set up illusions and experiments." In attempting to recreate experiments from my own studio and with limited resources, I had to take a creative DIY approach to the way in which I used technology, which in turn informs the aesthetics of the work. This is clearly evidenced through the Autoscope (Appendix 6), a low-cost and innovative solution to an otherwise expensive problem which was rapidly prototyped. Similarly in the MGE, a two-way mirror is used with an infrared camera (created from a hacked web camera), which was placed behind so that it is possible to make a video analysis of the face during the experiment using open-source and freely-available software (Section 5.3.3).

#3 Aesthetics of Experiments

The aesthetics of my work are driven by practical constraints; the resulting functional aesthetic is reliant upon whatever materials are available. This is not haphazard and requires an in-depth process of selection[166]. Dr Poliakoff commented on the attention to detail in the presentation and the experience of the experiment, the customised stamps, badges, and documentation: "...we don't particularly think about it (the experiment) looking attractive…some of our labs are not the most beautiful and maybe feel a bit like a broom cupboard…we haven't really thought through what that would feel like for the participant…".

#4 Value of (Perceptual) Experience During Experiments

The workshops used warmup tasks and activities that would prepare the participants for the experiments that followed. The participants' experiences during the workshop are the focus of the work. Dr Poliakoff noted that in a scientific experiment, "…we would want to measure the person's perceptual experience during an experiment, but that in itself is not the goal [of the experiment]…the experience itself for them is not important to us necessarily…" Also, "...capitalising on things like people's prior experience and suggestibility and order effects, so

[166] For example, sourcing just the right tables and chairs and clipboards for STOATA (Chapter 8) by scouring Rogue Artists' Studios for materials (see Chapter 7)

all things that we would largely want to try and rule out or control in a psychology experiment…whereas as an artistic experience the aspects can be deliberately amplified".

#5 Collaboration With the Participant

In the workshops, the subjective and creative experiences of the illusions are used to shape further iterations of the workshop. Dr Poliakoff drew parallels here with BEAM Lab's ongoing interest in patient and public involvement; Listening to first-person experiences of people with conditions that they are interested in and understanding the value of those descriptions.

#6 Benefits to Lab Members

Dr Poliakoff's final point related to the general benefits for lab members in having an artist as part of the group. Presenting the project to the group and testing activities with the group, (such as a drawing workshop, which used drawing activities and perceptual experiments)[167] allowed them to see a different perspective on their work and 'think differently'.

9.3 Impact of the Research

Impact in research is measured by potential and actual real-world effects beyond its academic context. This interdisciplinary study is clearly practice-based artistic research, but has taken place between the fields of art and science. The impact of this work beyond its artistic context has, in part, been shown through the previous section, which gave an outline of the different ways in which the research influenced Dr Poliakoff's thinking and generated new questions for further research. The primary method used was artistic workshops; workshops are inherently impactful since they can both communicate and share an experience of the research and the ideas embodied within it. The public workshops engaged new audiences in the research[168] through practical 'hands-on' activity. The workshops also involved artists and fellow researchers, which contributed to ongoing critical discussions around science art collaboration and interdisciplinary practice within my networks (as mentioned in Section 2) and beyond (see Section 9.4).

[167] 'Drawing for problem solving' workshop with Beam Lab, 14th October, 2020.
[168] For example, the public workshops at the Whitworth (Section 4.1) and Manchester Art Gallery (Section 4.5) engaged audiences in scientific experiments based on perceptual experiences as a means to create a dialogue around artworks in the gallery.

There are two specific examples of the lasting impact these workshops have had on other artists. One of the participants (P#1) from the initial CHI workshops (Section 4.1) stated how she has been thinking about the experiment a lot while she has been creating work, and that some of those sensations she experienced during the CHI experiment returned while she was working with the clay, e.g. an overwhelming maternal feeling over the object and the tools she was using[169]. After the RMP 1 workshop (Section 4.2), one of the participants used the methods to create a new work, 'Prox' (General practice, 2019).

This research has had a significant impact on my practice, imposing a creative tension which had transformative effects, in addition to the reflections on expanded art practice and interface objects[170], which enabled me to examine the osmotic effects of collaboration and participation in my work. As was mentioned in the introduction, a key motivation for this research was to become more productive as an artist. This was achieved though framing workshop as art, a dynamic model of practice which can be rapidly deployed. It can occur completely independently, in a gallery space or as part of an exhibition programme, taking place as a home visit, in my own studio, or as a walk (see Section 9.4).

[169] Personal communications, Instagram, direct message, 13 June, 2018.
[170] As outlined in the methodology and illustrated through the model of expanded practice and interface objects (Section 3.3).

9.3.1 Somaesthetics, Mindfulness and Imagination.

As mentioned in Section 3.4, somaesthetics is a meliorative study which advocates disciplined forms of bodily practice (such as meditation) and care of the self (Shusterman, 2008:19). Exploring my practice through the lens of somaesthtics has led to understanding the warmups and initiations I use for my workshops as methods of mindful practice (Section 3.4). I began to explore the workshops as spaces for reflection and introspection — as reflective experiences. The illusions were not only the subjects of the research; they were also processes which had an effect on my practice.

Scientific studies of art suggest that art experiences[171] have an ability to change perspectives and make us more empathetic to others (Winner, 2019:196). Similarly, recent work using perceptual illusion is shown to have long term and sometimes profound effects on those who participated[172] (discussed in Section 1.4.2). Scientific studies of meditation and other mindful practices have also shown positive effects that are similar to sensory deprivation; while this is not perceptual illusion specifically, there are similarities in the methods and experiences of the Ganzfeld or MGE (discussed in Section 5.4). There is less evidence to show the long-term perceptual effects of experiencing perceptual illusions (see Section 9.4. Further Research).

I have shown through this thesis how the research has had a deep impact on my practice and my perceptions. Through the course of this research, I have acted as a crucial participant — as a non-scientific control. As a result, I have become a longitudinal data strand within it. I had to engage in these illusory experiences myself for many hours. These are difficult, and often nothing happens at all (as was the case with my initial experience in the CHI in 2011), but over time, with practice and training, I got better at experiencing the illusions. I was able to remember the triggers and signs and to follow these into the experience more quickly. Through these experiments, I developed a deeper understanding of my own perceptual experience — of how my sense of ownership over parts of my own body are in fact an ongoing active process and can be manipulated and changed easily. By simulating an out-of-body experience using the Autoscope (Appendix 6), I had a revelatory insight on my own periods

[171] Both in terms of viewing art and making art.
[172] Such as the Be Another Labs' use of the body Swap Illusion (Ehrsson, Valeria I., 2008) which enabled participants to see from the perspective of another person (Be Another Lab, 2018:online).

of involuntary anxiety-induced depersonalisation[173]. This is an area that I believe warrants further research (discussed in the following section).

[173] Depersonalisation disorder is an anxiety-induced phenomenon which results in "experience of feeling unreal, detached, characterised by a disruption in self-awareness and emotional numbness". See https://www.nhs.uk/mental-health/conditions/dissociative-disorders/ [Accessed on 13th March 2020].

9.4 Future Work

This thesis represents a period of deep self-reflection in which the practice was infused with fresh ideas and took on new theoretical perspectives. This research journey is embodied within the works presented to support this thesis. The research itself is an interface object, an entity which evolved through a series of iterative events; new ideas have been developed and this cycle will continue. Therefore, the effects of the research do not end here (with this thesis); the effects are ongoing and part of a continuum. Having completed this research, I now prepare for a harsh atmospheric re-entry into a struggling post-pandemic economy and an uncertain future as an independent artist, and I face the challenge of finding new opportunities. In light of this, I have deliberately framed the outcomes of this research both as evidence of practice and as a series of proposals; the workshops are interface objects and retain an active or potential energy. This point is emphasised through the works rendering as three-dimensional axonometric drawings[174], which reinforce the work as ideas, ripe for potential future realisation. Each future workshop will serve to facilitate a new discussion, and serve as generative mechanisms which will re-enforce the practice. In terms of sharing the outcomes of this research and making it felt in the wider arts community, both the workshops, and the methodology (the associated text and drawings), can be exhibited as artworks, or participated in as workshops. I will now look for opportunities to publish this work, as a series of short papers, through journals in the field of science and art collaboration.

The following sections give a brief account of plans and trajectories future research. These plans include the Bryophytes Project at Gallery Oldham and further research into biofeedback and the relationship between anxiety and perceptual illusion.

[174] A technical drawing technique used to illustrate three-dimensional forms without perspective, commonly used for engineering architectural purposes (proposals and patents).

Gallery Oldham, Bryophytes Project

An opportunity rolling over for this Ph.D. is an NWCDTP-funded residency and research placement at Gallery Oldham. The aim of research placement is to draw attention to the effects of climate change, by responding to specimens in the natural history collection, specifically, the bryophytes (mosses and lichens). This will involve working in the field with amateur naturalist groups and the curator re-collecting samples of mosses and lichens by revisiting previous sites of collection dating from the Victorian era. The outcomes of the research will be through writing, workshops and resources that will be developed for the public program (spring 2021).

Biofeedback

The use of physiological data (GSR) to feedback into the illusory experience was not fully resolved through this research (Section 5.4.3). More research is needed, with the addition of a control study, to discover if there is a correlation between sound quality or flickering light and incidents of hallucination in the MGE. Similarly, the use of the two-way mirror in the MGE (Section 5.3.3) opens up the potential to use eye-tracking software[175] during the experiment; this could give information about rates of micro-saccades cards and points of fixation during the illusion. However, tools have been developed which will enable this research to continue. These questions can form the basis for a future research or exhibition proposal.

Anxiety and mindfulness.

As a participant in this research, I have learned as much about the way in which others experience my work as I have about my own everyday experiences. This led to drawing parallels between the experience of perceptual illusion and mindful practice which connect the three experiments (discussed in Section 5.4) and discussing mindful practice and anxiety within the frame of my practice[176]. Little work has been done to explore the relationship between mindful practice and perceptual illusion. I believe a longitudinal study, building on these methods outlined in this thesis, would be an interesting direction for future post-

[175] Due to the coronavirus restrictions, it was not possible to pursue this with the equipment at BEAM Lab.

[176] In the later stages of the research, I presented a paper titled 'You Are the Object of Your Own Observation' (Hall, 2021), in which I discussed the aspects of experimental phenomenology and mindful practice within the research.

doctoral research — specifically, the use of these multisensory illusory experiences as tools for the exploration of anxiety and the growing phenomenon of depersonalization.

9.5 Final thoughts

The three experiments, performed through the workshops, demonstrate several fundamental principles of the practice as defined in the manifesto of Tabletop Experiments (Appendix 13). For example, the experiments focus on 'specific behaviours' and 'phenomenon of perception', such as hallucinatory experiences. The workshops are environments formed through parameters, or 'control structures'. These illusions are fleeting and momentary; they come and go and sometimes nothing happens at all. The experiments encapsulate the notions of sustaining and nurturing precariously balanced systems on the cusp of failure. My practice is concerned with perpetuating and exploring these emergent, unusual, sometimes chaotic behaviours which occur when a system is brought to the limits of its functionality. These are unstable phenomena which require systems of maintenance[177] to be created around them[178]. It is these 'unstable interfaces'[179] which provide the working material for my practice. The workshops developed through this research explore how the perceptual system can exhibit 'interface-like' properties, and through understanding its parameters, in terms of experimental process, perceptual experience can be exploited as working material. Illusory experiences, as brought about through sensory deprivation and other experimental models, can be thought of as a manifestation of this 'unstable interface'.

Illusory experiences are immediately engaging, yet understanding the processes or working creatively with them can offer more benefits. To perform perceptual illusions effectively, a certain amount of trickery is required. Asking participants to step into a black box or to place

[177] This process of nurture or maintenance brings a performative element to the work and often requires the design of an elaborate system to perpetuate the phenomenon.
[178] For example, 'Perpetual Puddle Vortex 2013' sustained an active vortex in an enclosed system, which demanded a precise balance between states to ensure its existence. With too much energy, the meniscus breaks and the puddle spills, not enough energy and the vortex won't form. This fragile system must be sustained. This system is on the cusp of existence (see Appendix 13).
[179] I developed this idea of the unstable interface through a paper presented at the IJADE Conference (Hall, 2016). An audience member reflected after the conference; "The relationship between Art and Science was highlighted once more by artist and keynote speaker Antony Hall. The idea of a line as a boundary, which in his words 'formed an unstable interface'… connected to a theme that emerged in his work of an oscillation in both material and idea" (Burton 2016:online).

a hand behind a partition or under a platform, the suggestion of a sleeve, and the use of blindfolds and Ganzfeld goggles are all reminiscent of the tools of the illusionist (as alluded to in Section 4.9). As an artist, there is scope to be able to play with these methods in a way that scientists might not. Scientists would not normally employ the use of warmups and cognitive primers with the hope of producing the illusion more effectively. Despite this, as has been shown throughout this thesis, questions worthy of scientific investigation have emerged. Wendy Angle, writing on the subject of the artist as subversive yet 'smart trickster', states that science and academia are the anti-thesis of deception, and that working at the interface between the science and art can have the effect of disrupting and challenging this division. "These are instances in the structure of academics where the boundaries between traditional disciplines are crossed. Scientists writing in a literary manner, and artists engaging with scientific methods, are examples of such trends…the trick is to shift perception by interrupting the habitual, expected or normal structure of a stable system" (Angel, 2012:online). Re-creating science experiments through the frame of art creates a liminal space which acts to subvert these underlying power structures. Perceptual illusions exist in a similar liminal space between the senses and disrupt the stability of the perceptual system.

There is a growing body of thought that suggests that consciousness is a series of simulations and that reality is an illusion. For example, neuroscientist Anil Seth proposes that reality is a series of 'controlled hallucinations' and uses the rubber hand illusion (Seth, 2017: 4min 37) to demonstrate that, necessarily, we are often unaware of the sensory and perceptual mechanisms that inform our experiences. This has the effect of optimising perception — filtering out the unnecessary information. As Claus-Christian Carbon states, "Illusions in a scientific context are not mainly created to reveal the failures of our perception or the dysfunctions of our apparatus, but instead point to the specific power of human perception" (Carbon, 2014:1). We believe the rubber hand is our own because we can see the tactile stimulation occurring simultaneously with what we feel. In both the Ganzfeld and MGE, the brain struggles to make sense of the ambiguous information it sees and does its best to make sense and create meaning from what it sees. This is most apparent in the MGE[180], in which

[180] This is somewhat less apparent with the Ganzfeld experience, which is often very abstract.

most participants experience vivid hallucinations, sometimes seeing recognisable faces that often relate to their own life experiences.

Art is of interest to scientists because of its ability to enable an "understanding of the visual brain because it explores and reveals the brain's perceptual capabilities" (Zeki, 2001:52). Science, specifically the science of perceptual illusion, is of interest to artists for the same reasons, as both have the capacity to reveal the invisible and offer frameworks of understanding that enable us to make meaning from the 'lifeworld' (Husserl, 1936:142). The workshops developed through this research are intended to be challenging encounters, disrupting the normal flow of sensory experience. They necessitate reflection on the strangeness of everyday conscious experience. Participants become observers of their own experience, in a feedback loop of their own imagination, witnessing the artefact features that are generated by perceptual processes.

Appendix

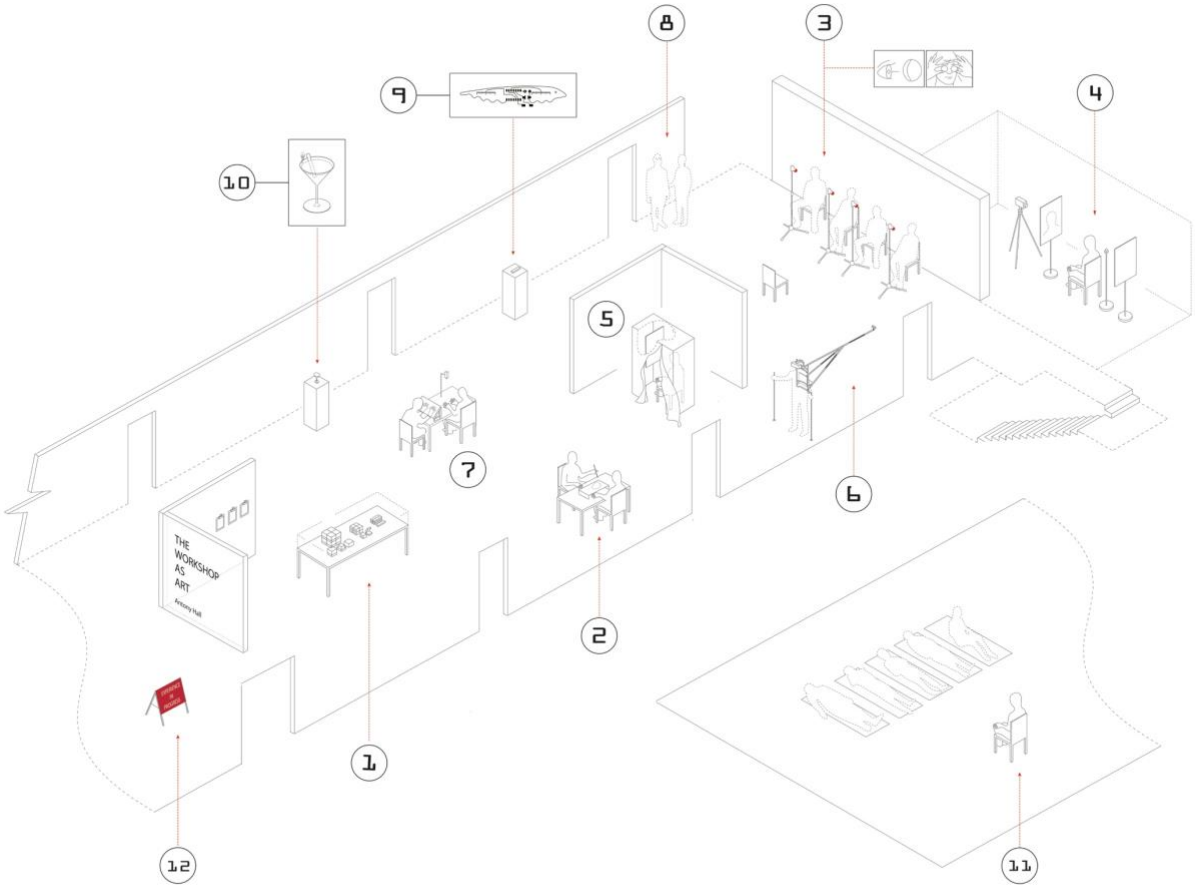


Figure 45: Exhibition plan

Appendix 1: **Workshop Editions**
Appendix 2: **Unfeasible Object Workshop**
Appendix 3: **Perception Without Object Workshop**
Appendix 4: **You Are the Object of Your Own Observation Workshop**
Appendix 5: **Mirror Gaze Box**
Appendix 6: **Autoscope**
Appendix 7: **Action Intention Paradox Workshop**
Appendix 8: **Navigation and Central Field Workshop**
Appendix 9: **Fish-Brain-Machine Circuit**
Appendix 10: **Electronic Taste Perception Workshop**
Appendix 11: **On the Inwardly Generated Image**
Appendix 12: **Experience in Progress Badge**

Online exhibition: http://antonyhall.net/blog/phd-exhibition/

Appendix 1: Workshop Editions

Figure 46: Workshop Editions.

Find information on the workshop editions through the following link:

http://antonyhall.net/blog/phd-workshop-editions/

Further information on each edition is also available in the following appendices:

Appendix 2: Unfeasible Object

Appendix 3: Object Without Perception

Appendix 4: You Are the Object of Your Own Observation

Appendix 2: Unfeasible Object

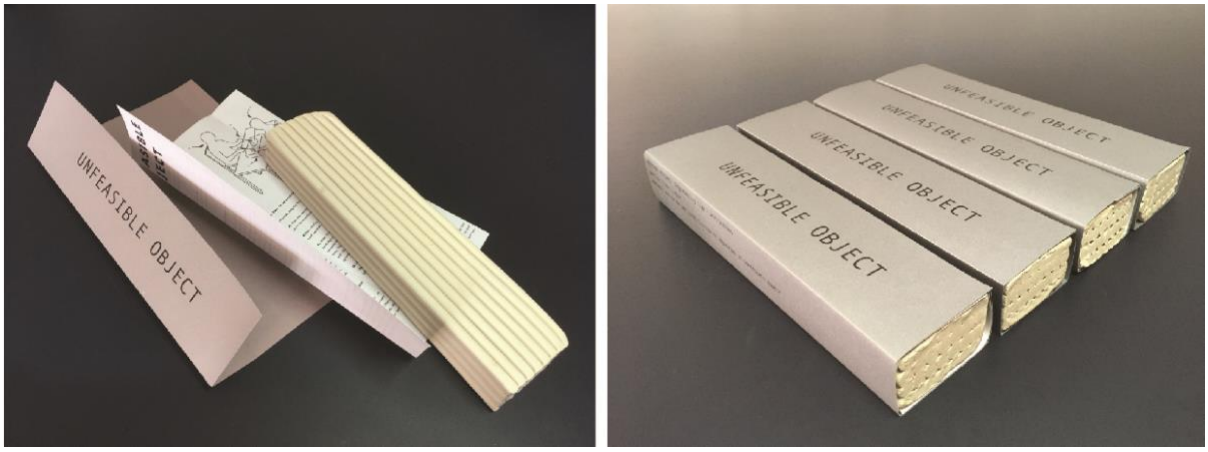


Figure 47: Unfeasible Object workshop edition.

The Unfeasible Object workshop is based on the CHI workshop. The resource consists of a card outer layer, over instructional documents which are folded around a 500-gram block of modelling clay. In addition to the resource, brushes and a platform or screen need to be made for the workshop. The instructions are simplified, so that they can be used for a streamlined workshop (Section 4.5) or extended to a full experiment (as outlined in Section 5.1). Since the clay block is destroyed during the workshop, once opened the packaging becomes a set of flat documents which can be kept along with the certificate of participation after the workshop. Participants can choose to keep or reuse the modelling clay after the experiment. This workshop lasts between 30 minutes to an hour, and ideally takes place face-to-face and does not lend itself well to virtual formats.

Workshop edition link:
http://antonyhall.net/blog/product/unfeasible-object-workshop/
Exhibition link: **http://antonyhall.net/blog/unfeasible-object/**

WORKSHOP RESOURCE
500g Modelling clay [White]

READ ALL OF THIS LEAFLET BEFORE YOU TAKE PART

- Keep this leaflet. You may need to read it again.
- Ask the artist if you need more information or advice.
- If you get any side effects, including any possible side effects not listed in this leaflet, make note of these and talk to the artist, or any other participants.

In this leaflet:

1. What is the Unfeasible Object experiment.
2. What you need to know before doing an Unfeasible Object workshop
3. How to do an Unfeasible Object workshop
4. Possible side effects.
5. Other information.

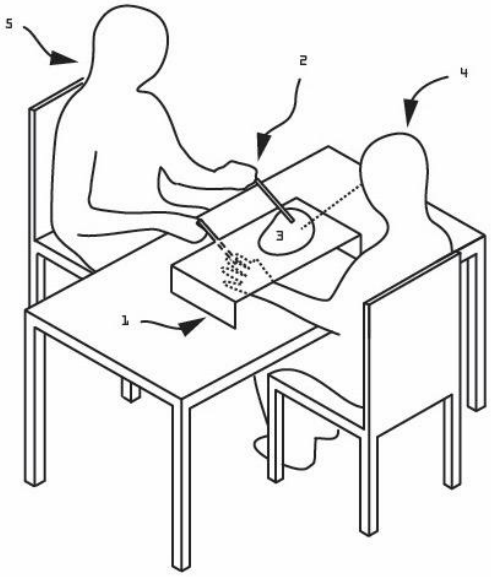
1. What is the Unfeasible Object experiment

The 'Rubber Hand Illusion' [RHI] shows it is possible to convince participants that a rubber hand is their own by placing it in front of them while stroking it in the same way as their hidden real hand. This experimental model, combining visual and tactile stimulation, is now used widely in experimental psychology to study issues around embodiment and body ownership. Recently similar techniques are used to make participants believe they have embodied someone's else's body, have an invisible body or have moved out of their own bodies [simulated out of body experiences].

These experiments reveal vulnerabilities in our perceptual system and allow us to question the nature of our perceived realities. The unfeasible object experiment builds on the RHI model and uses a self-made clay object in place of the rubber hand to test the possibilities of this illusion. Furthermore, clay affords a further potential of changing the shape of the object during the experiment. Does the act of making an object increase our potential to feel ownership over an otherwise unfeasible object? What is the role of imagination in this illusion? And how do actions, i.e., how these objects are made and handled, affect how these objects are embodied?

2. What you need to know before doing an Unfeasible Object experiment

The 'Unfeasible Object' experiment belongs to a group of perception-altering experiments, commonly described as multi-sensory or tactile perceptual illusions that combine tactile and visual stimuli. These known to affect perceptions of body ownership. These include the Simulated out of body experience, Bodyswap, handshake, rubber hand, Invisible hand, Invisible body, three hands and Pinocchio illusions.



3. How to do an Unfeasible Object workshop

Materials 500g clay block, platform [1], brush [2].

A. Make clay objects. Firstly, make one that looks as hand like as possible and process with an unfeasible clay object that is non-hand-like.

B. Place the clay hand/object [3] in front of the participant where their real hand would be.

C. Hide their real hand under the platform [1], and stare at the clay hand/object [4]. Ask the participant to keep focussed on the hand and concentrate hard. Ask the participant to imagine that the object is their hand. Note: With the more non-handlike objects, you will have to work with the participant to re-map the hand to the object. For example - agreeing where the index finger or thumb might be.

D. Take two pencils or brushes [2] and tap or stroke both the hand and the object simultaneously. It will take some practice. During this process keep asking how it feels. Ask probing questions such as:

- Do you have any unusual sensations, can you describe them?
- How do you feel about the clay hand at the moment?
- How do you feel about your real hand at the moment?
- How intense is this sensation?
- How comfortable do you find this sensation?
- Have these feelings changed over time?

Occasionally try tapping out of synchronisation or tapping the clay hand while not tapping the real hand – this might make them feel like the hand has gone numb. It doesn't always work, so try swapping over and come back to it later.. **Continues overleaf....**

Figure 48: Workshop edition / Insert detail page 1.

Appendix 3: Object Without Perception

Figure 49: Object Without Perception / Workshop edition.

The 'Object Without Perception' workshop is based on the Ganzfeld experiment. The workshop lasts approximately one hour and is ideally suited to virtual formats. The resource contains a set of handmade Ganzfeld goggles, which are crafted from Ping-Pong balls and feature an elastic strap for ease of use. Inside the box, a set of folded instructions are provided. For an extended version of the workshop, participants could create their own goggles. In addition to the resource, lighting and sound equipment are required. Since this experiment is so easy to set up, this workshop lends itself well to virtual formats.

Workshop edition link: **http://antonyhall.net/blog/product/object-without-perception-proximity-cv19-edition/**

Object Without Perception exhibition link:

antonyhall.net/blog/object-without-perception/

OBJECT WITHOUT PERCEPTION

WORKSHOP RESOURCE

x 2 Translucent White Hemispheres
45mm diameter

READ ALL OF THIS LEAFLET CAREFULLY BEFORE YOU USE GANZFELD HEMISPHERICAL DOMES.

- Keep this leaflet. You may need to read it again.
- Ask the artist if you need more information or advice.
- If you get any side effects, including any possible side effects not listed in this leaflet, make note of these and talk to the artist, or any other participants.

In this leaflet:

1. What are Ganzfeld Hemispheres and what are they used for.
2. What you need to know before using Ganzfeld Hemispheres.
3. How to use Ganzfeld Hemispheres.
4. Possible side effects.
5. Other information.

1. What are Ganzfeld Hemispheres and what are they used for.

Ganzfeld hemispheres are placed over the eyes and used in conjunction with a bright, ideally monochrome red light source. The term Ganzfeld (from German for 'complete' or 'total field') was introduced in the 1930s by Gestalt psychologists. It is a phenomenon of visual perception experienced when looking into a featureless unstructured field of light. After extended periods of time many observers begin to see vivid hallucinations. The experience of Ganzfeld is known to alter states of consciousness, and can increase alpha brain waves, which are associated with deep relaxation and creativity. Polar explorers have reported similar experiences and altered mind states when traveling through featureless landscapes.

Early methods used in the 1930s by Wolfgang Metzger and others, to induce the Ganzfeld effect included staring at a perfectly smooth wall or large sheet of paper. Later in the 1950s experimental psychologist James Gibson used specially constructed rooms with spherical surfaces. The use of translucent hemispheres placed directly over the eye was first pioneered by Julian Hochberg in 1952 and are now routinely used in laboratory studies. Ganzfeld Hemispheres provide a convenient and cost-effective method of experiencing the Ganzfeld effect from the comfort of your own armchair or laboratory. The term 'Ganzfeld experiment' is commonly associated with parapsychology, in which it was used to test individuals for extrasensory perception [ESP] and telepathy. In the 70s William G. Braud and Charles Honorton used the technique to put participants in a state of sensorial depravation which was said to be conducive to ESP.

In more recent times the technique has been adapted for recreational use. Artists have created immersive experiences using rooms filled with fog [Olafur Eliasson] and illuminated with monochrome stroboscopic light (Carsten Holler / Kurt Hentschlager) and used hemispherical rooms (James Tyrell). The Ganzfeld technique can be used recreationally in conjunction with electronic devices such as brain-machines and dream-machines which generate stroboscopic light often in conjunction with biofeedback.

2. What you need to know before using Ganzfeld Hemispheres

Ganzfeld hemispheres belong to a group of perception altering devices [such as Head Mounted Displays, virtual reality goggles, blindfolds and welding goggles] which are known to affect your ability to engage with the real world and temporarily impair sight.

Always tell someone if you intend to use Ganzfeld Hemispheres.

DO NOT USE IF YOU:

Are prone to feeling claustrophobic.
Are regularly hallucinating in everyday life.

IMPORTANT WARNINGS:

For external use only.
Do not operate heavy machinery.
May cause hallucination.

3. How to use Ganzfeld Hemispheres

Place Ganzfeld Hemispheres over eyes. Secure with elastic or surgical paper tape. For best effect it is advisable to stare with eyes open into a bright red light for a duration of at least 30 mins. Listen to white noise. Depending on taste, variations can be made to the experiment using sunlight or other coloured lights. Different sounds can be used such as brown or pink noise, or the sound of a waterfall for example. A Link is provided to a white noise sample for use during an experiment.

Duration: 30mins + / Repeat as necessary. Ganzfeld experiments have lasted for as long as 24-48 hours.

Post experiment: Make note and report the effects. Consider the following prompts for reflection:

- Did you see any colours, shapes or patterns?
- Did you see any movement?
- What emotions did it provoke?
- What did you hear?
- What bodily sensations did you feel?
- Did you see recognisable forms, objects or people for example?

4 Possible side effects.

Many participants will experience no side effects what so ever. However, the following are widely reported:

- Relaxation. Ganzfeld is generally relaxing and can be an enjoyable experience.
- Boredom.
- Misperception of time (time may pass more quickly or slowly).
- Perceptions of changing colours and unexplained flashes of light.
- Fractal like patterns (often when used with stroboscopic light).
- May enhance telepathic abilities and extrasensory perception [ESP].
- The sensation of a presence in the room (when used for extended periods).
- The distant sound of music when there is no music present.

Other information:

Zoom Meeting ID

Antony Hall 2020
Tabletop Experiments Ltd.
www.antonyhall.net

Figure 50: Object Without Perception, edition insert detail.

Appendix 4: You Are the Object of Your Own Observation

Figure 51: You Are the Object of Your Own Observation.

'You Are the Object of Your Own Observation' is a cuboid box containing a wooden candle-like LED device (the F-LED), sensor cables, and an instructional document (Appendix 4). This can be powered directly from a 5-Volt USB socket or plugged into a computer. A GSR sensor and push button are included on a cable that plugs into the side. The flicker rate of the LED changes in response to sweat levels on the fingertips. When plugged into a computer, F-LED can render the data in real time to the computer screen and generate modulated white noise, which also reacts to the GSR data. Again, as with 'Object Without Perception', this workshop can be extended to include the assembly of the electronic device. This workshop lasts between thirty minutes and one hour and can be conducted virtually. In the virtual workshop, participants need to source a mirror and portable sound system in addition to setting up a dark space at home, so the workshop is best conducted after dark.

Workshop edition Link: **http://antonyhall.net/blog/product/you-are-the-object-of-your-own-observation-26-31-100/**
Exhibition link: **http://antonyhall.net/blog/yatooyoo/**

YOU ARE THE OBJECT OF YOUR OWN OBSERVATION

In this leaflet:

1. What is the mirror gaze experiment and what is it used for.
2. What you need to know before doing a mirror gaze experiment.
3. How to do a mirror gaze experiment.
4. Possible side effects.
5. Other information.

1. What is the mirror gaze experiment and what is it used for

During the mirror gaze experiment participants are asked to stare at their own refection in a mirror in a nearly dark room. A faint outline of the head is visible like a faint silhouette. In this state of partial sensory deprivation, the brain struggles to make sense of the information it sees. Forms and shapes begin to emerge as if from nowhere. For many observers these develop into vivid visual hallucinations. This phenomenon, known as the 'Strange face illusion' emerges through a complex interaction of physiological and cognitive processes and unconscious projection and can elicit a strong emotional response in participants.

This resource contains a flickering LED device [F-LED] [3] that is used to provide low level lighting during the experiment. The F-LED reacts to galvanic skin response [GSR] which is commonly used as a measure of emotional response. This is a measure of the changes in moisture levels on the fingertips [sweat response]. The F-LED plugs into a 5v USB socket [5]. The sensor cable is plugged into the upper socket [6]. Sensors are attached to the finger tips [4] . This data is used to control the flicker rate of the F-LED. The FLED should be placed behind the participant [2] in such a way the wall or space behind is illuminated.

2. What you need to know before doing a mirror gaze experiment

The mirror gaze experiment and the strange face illusion belong to a group illusory experience related to sensory deprivation which are known to lead to hallucinatory experiences; some participants see moving patterns faces, illusory sounds for example.

Always tell someone if you intend to do a mirror gazing experiment.

IMPORTANT WARNINGS

DO NOT TAKE PART IF YOU:

Are prone to feeling claustrophobic / or are scared of the dark.

3. How to do a mirror gaze experiment

Materials: Dark room speakers, Mirror.

Use a room which can be blacked out or do the experiment after dark [A bathroom could be ideal]. Using a portable speaker play the sound of white noise, or the sound of a waterfall for the duration of the experiment. Sit or stand in front of a mirror so you can see your head and shoulders [See Fig. 1] . The F-LED should be placed behind you in such a way that it illuminates the wall behind. The light should be reduced to the point where you are no longer able to perceive you own facial features and can only see an outline of your head and shoulders. The light might need to be adjusted as the experiment progresses and your eyes adapt to the dark. Remain absolutely still and focus on what you can see in the silhouetted outline of your head.

After some time, you may experience strange or anomalous visual manifestations. Make a mental note of these. Consider the following prompts for reflection:

- Did you see any colours, shapes or patterns?
- Did you see any movement?
- What emotions did it provoke?
- What did you hear?
- What bodily sensations did you feel?
- Did you see recognisable forms, objects or people for example? ☒
- What kinds of patterns or shapes did you see?
- Did you see the faces of people other than yourself?
- Did you see an aura or glow?

Fig.1

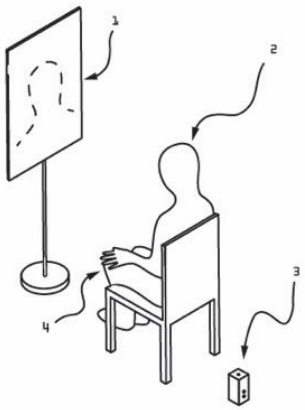
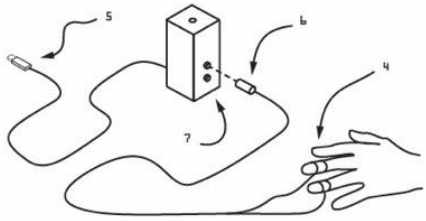


Fig.2



4 Possible side effects.

mirror gazing is generally relaxing and can be an enjoyable experience but many participants will experience no side effects what so ever. However, the following are widely reported:

- Relaxation.
- Misperception of time (time may pass more quickly or slowly).
- Perceptions of changing colours and unexplained flashes of light.
- Vivid hallucinations / illusory presence
- The distant sound of music when there is no music present.
- Intense boredom.

5. Other information:

Antony Hall
antonyhall.net

Figure 52: You Are the Object of Your Own Observation / Edition insert detail.

Appendix 5: Mirror Gaze Box

The Mirror Gaze box was developed to provide a blackout space for the ‘mirror gaze experiment’ and was used for the 'You Are the Object of Your Own Observation' workshop when a blackout room was not available.

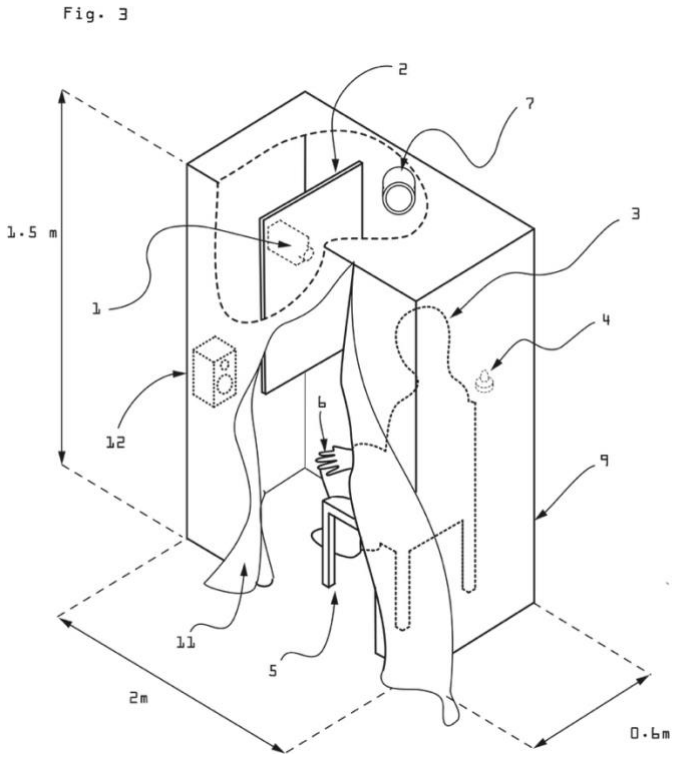


Figure 53: Mirror Gaze Box, diagram.

The Mirror Gaze box, 1.5x2x0.6cm wood, cloth, electronics. Night vision camera (1) Mirror (2) Seated participant (3) LED (4) Chair (5) sensors (6) Infrared spotlight (7) wardrobe like construction (9) Speaker (12) surrounded with a black curtain (11).

Exhibition link:

http://antonyhall.net/blog/mirror-gaze-box-2/

Appendix 6: Autoscope

The Autoscope is a mobile, wearable version of the simulated out-of-body experience (OBE) experiments. These use a live feed from a video camera, which is then sent directly to a head-mounted display. The video camera is mounted behind the participant in such a way that they can see themselves from behind. This live footage is then used as the visual stimuli in a similar way to the rubber hand in the 'rubber hand illusion'. Tactile stimulus comes through prodding the real body in synchronisation with the empty space beneath the camera (the virtual body); the participant can then be made to believe that they exist at the point of the camera — in other words, in a location outside of their body.

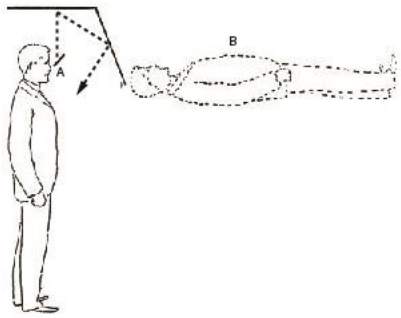


Figure 54: Inverted Body Experiment / G. Stratton 1896

The first reference to an out-of-body experience was made by George Stratton. Stratton was pioneer of the well-known 'inverted vision experiments', for which he devised prismatic goggles which literally turned the world upside down. In the experiment, he claimed to have used the goggles for seven days; crucially, when he removed the goggles for a short time, he perceived the world as upside-down (Stratton, 1896). A lesser-known experiment is the 'inverted body experiment' (Figure 54), which used a series of mirrors, mounted on the body, which visually inverted the position of his body. As with the 'inverted vision experiments', Stratton claimed to have used the device continuously over several days. I created the Autoscope in this spirit of real-world self-experimentation as a means to give myself an out-of-body experience, to explore the effects of this over a longer time frame, and to see how this affected my interactions with the real world.

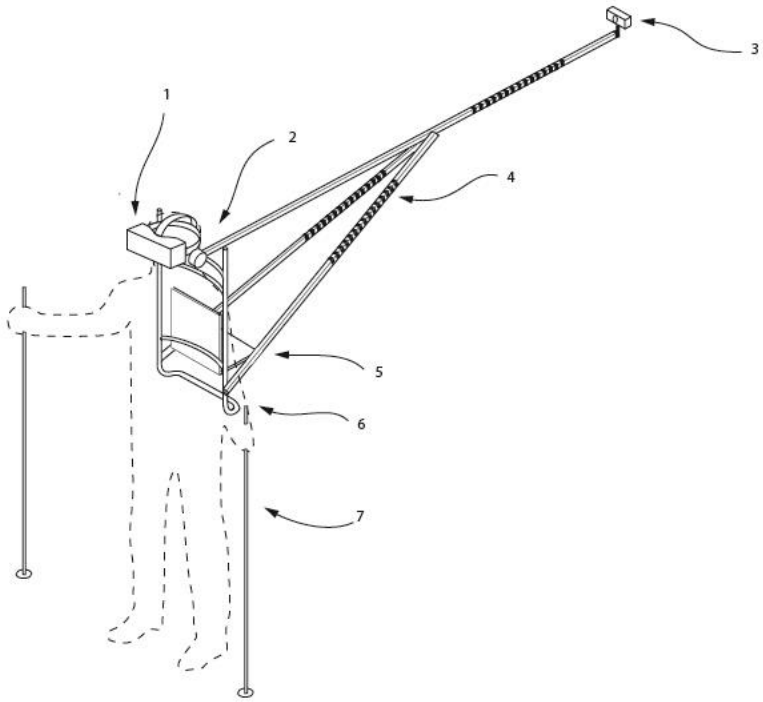


Figure 55: Autoscope.

The Autoscope builds on the simulated OBE model by placing a camera (3) two meters behind the participant, mounted on a wooden beam (4) attached to an aluminium backpack frame (6). The webcam connected to a laptop[181] (5), where the live footage and sound is captured[182] and converted into a stereoscopic format, which can then be transmitted to a head-mounted display (1) (a smartphone[183]), using a screen-sharing application[184]. Sound is directed from the webcam microphone to the headphones (2). The initial experience of using the Autoscope is disorienting; it is also difficult to balance. Therefore, walking sticks (7) are essential for safety. Using the Autoscope requires some commitment to training in a safe space. It is important to have an assistant to guide and document the experience.

Experimenting with the Autoscope (like Stratton's 'inverted body experiment') necessarily requires the participant to move through and interact with different kinds of environments, effectively in third person. Simple tasks, such as moving objects through doorways and walking upstairs and downstairs, become unexpectedly challenging. In addition to the visual

[181] Andrew Brooks and I explored an alternative method which bypassed the need for a laptop using 360-degree video camera with a live feed to a smartphone. As you move your head, you are able to see in all directions without having to swing the arm. However, there is a problem – the compass sensor means that as you move, so, too, does the point of orientation in the camera, leaving to some incredibly disorientating and interesting experiences.
[182] Using OBS www.movavi.com [Accessed on 20th July 2020].
[183] Such as 'Google Cardboard'.
[184] Such as Duet www.duetdisplay.com [Accessed on 20th July 2020].

element of seeing oneself from a different location, using a webcam microphone that is routed to headphones allows the participant to hear from a point outside the body. I found that this acts as a substitute for the tactile stimulus (prodding) used in the original experiment[185], making me realise that I felt I was located at a point outside of my body, at the same point as the camera.

The physicality of this durational, augmented interaction with the real world forces the participant to change the way they interact with space and objects. Because the camera is fixed to the body, the participant has to use their bodily movements to change the visual perspective. The Autoscope is a performance-like or workshop-like experience which ideally would occur as part of a workshop, as it requires some preparation and training. There are also concerns for health and safety in terms of asking people to carry a relatively heavy load that is liable to move around and potentially cause injury. Therefore, at time of this writing, I remain the only person to have used it for any significant amount of time.

Experimenting with technology and perception in this way — as a form of augmented actual reality — offers critical perspective on virtual reality as a creative medium. Despite my attempts to make this as light as possible (it does indeed feel lighter than one might expect), the weight and awkwardness of the contraption has a significant effect on the user experience. After time, the Autoscope becomes a difficult burden to bear. (After five kilometres, I started to experience pain and cramps in my back and shoulders). I found this weight to be an apt metaphor for technology as a creative medium — something which presents endless possibilities but also in entraps its user in a relationship with that technology. Similarly, the idea of using a technology that allows its user to exist outside their own body would seem like the ultimate transcendence. However, rather than allowing its user to escape from the confines of reality, the Autoscope affords a difficult experience, one that comes closer to a form of impedance.

Exhibition link: **http://antonyhall.net/blog/autoscope/**

[185] It was interesting to place different sound sources around the space (e.g. radio or fans) as well as move through groups of people and attempt to engage in conversations.

Appendix 7: Action Intention Paradox

Action Intention Paradox was developed as a workshop activity to be used as an initiation for the ‘clay hand’ and ‘unfeasible object’ experiments, in conjunction with the ‘invisible hand’ and ‘spontaneous sensations’ experiments. Likewise, this experiment would make an ideal initiation to the Autoscope. As mentioned, when using the Autoscope (Appendix 6) , I often had the sensation that I was being guided by my virtual avatar, which in turn led to a feeling of loss of agency over my movements. This effect was most apparent when there was a slight delay between the live video and my own movements.

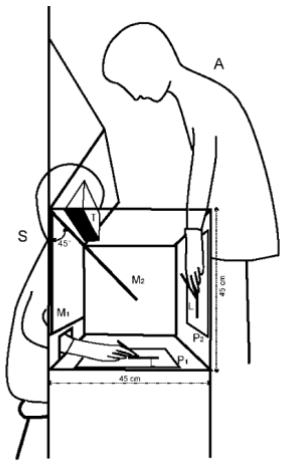


Figure 56: The alien-hand experiment / Nielsen 1963

The ‘alien hand experiment' (Jesper, 2018:7) provides a useful model for exploring the effects of synchronous and asynchronous interactions between visual feedback and physical movement. In Nielsen's experiment (Figure 56), the participant (S) views what they believe to be their own hand through a slot (M1) while drawing a line between point A and point B (P1). Unbeknown to the participant, when the experiment begins, the experimenter (A) flips a mirror and swaps the view to the experimenter’s own hand (P2). The participant is surprised to find they seem to have lost agency of their own hand.

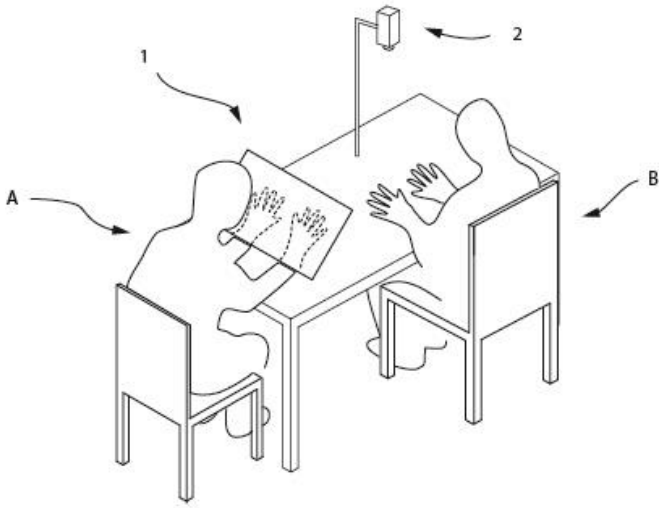


Figure 57: Action Intention Paradox.

Action Intention Paradox (Fig. 57) uses a flat-screen video monitor (1) mounted on a frame, which elevates the screen in such a way it is possible for Participant (A) to place their hands underneath it. A video camera (2) is mounted above the table and is focused on the hands of Participant (B). The live footage is fed directly to the screen (1). The screen (1) and camera (2) are positioned in such a way that it seems as if Participant (A) can see their own hands underneath the screen. However, Participant (A) actually sees the hands of Participant (B). Participant (B), sat adjacent to (B), can see Participant (A)'s hands under the screen, and can now copy or lead movements for (B) to copy. This is similar to the methods used in the simulated out-of-body illusion or 'hand-shake' illusions, in which synchronous body movements are used as the stimuli to draw participants into the illusion.

Using this setup, it is possible to try a number of different experiments. Most effective was simply mirroring each other's hand movements. After a short time, Participant (A) begins to feel some ownership over the hands on the screen. Through the workshops, I discovered it was best to start with very simple movements, then to gradually attempt more complex tasks such as drawing or sculpting with clay. As it is difficult to accurately copy the more complex movements, there are often moments of confusion where Participant (A) feels as if they have lost agency over their hands. Both participants seem to forget who is leading whom. In many cases, the participant, looking at the screen, asks, "Who is leading this?" or states, "I can't remember who is following who." What is also interesting with the drawing variation is that

Participant (A) feels ownership over the drawing (B), the drawing they have seen being created by (B) on the screen, rather than the one they drew unseen under the screen.

Exhibition link: **http://antonyhall.net/blog/action-intention-paradox/**

Appendix 8: Navigation and Central-Field Workshops

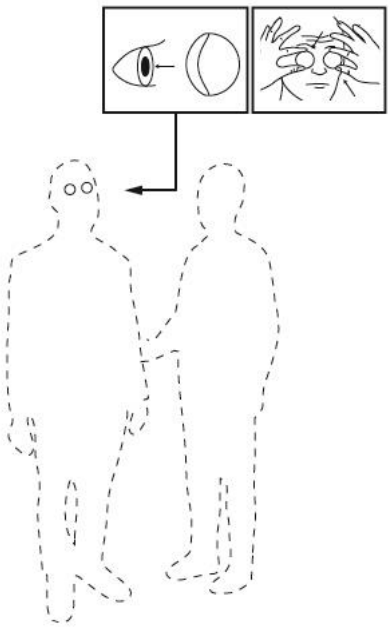


Figure 58: Ganzfeld Navigation.

The Navigation workshop is based on the Ganzfeld experiment; rather than sitting still, participants guide each other through spaces or environments, moving through space while using Ganzfeld goggles in order to explore how this alters perception of the spaces and sensory awareness more generally. The 'central-field' workshop is similar but uses a modified Ganzfeld goggle with a small hole in the centre of each hemisphere. This affords some vision centrally and cuts out peripheral detail completely. The effect of seeing through the small aperture had the effect of ‘seeming like seeing the world like an old movie’ (P#44), giving a small fuzzy-edged image framed in white. Several participants commented that it was like having microscopes for eyes (P#46, P#46), since it seems to force the participant to focus on small details of thing that are close; these then seem to be enhanced. Participants can move independently, but they need a guide to ensure safety. In some experiments, participants followed a string threaded through trees.

An account of my own experience of the ‘central-field experiment’ follows; I was navigating a challenging rocky, gravelly footpath.

"Though I could hear others around me, it was extremely hard to tell where they were, and at what distance they were from me. With only limited visual information, I found myself getting distracted by the sounds of others, trying to work out what direction they were coming from. I quickly found myself to be disorientated. Even though I could clearly see details of the soil and grass at my feet, the details of foliage, there was no context for this information, and thus it was difficult to build an overall picture of the path or plan which direction to go. While I was walking, I thought some of the other participants were just in front of me, and that I was walking with them, I was even talking to them. As I removed the goggles I realised, they were in fact at some distance ahead, unable to hear me, but I was convinced of their presence near me. It was as if my perception of these sounds had become heightened. My perception of distance seemed to change as well, feeling as if I had moved a long way when in fact I had not moved far."[186]

Exhibition link: http://antonyhall.net/blog/navigations-2/

[186] Personal account based on a 20 minute central-field experiment, Middlewood Trust, 12/09/2018.

Appendix 9: Fish Brain Machine Workshop

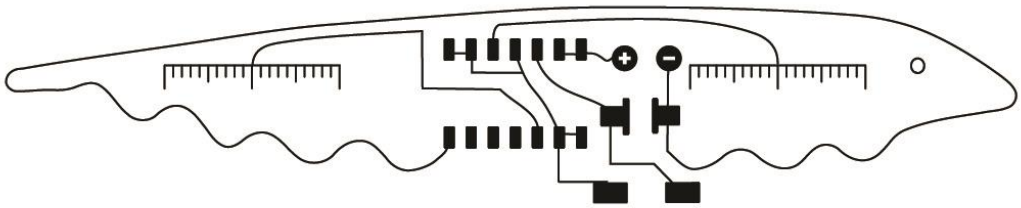


Figure 59: Fish-Brain-Machine, Hall / Dusseiller 2012.

Chip spec: CMOS Quad-NAND gate

Capacitor: 470nJ = 0.47uF at 63V

2x Resistor (8 MOhm)

2x LED (Superbright / colours optional)

1 x Battery Clip (either 9V clip – very bright, or 2 holders for 3V coin batteries)

The Fish-Brain-Machine was a collaborative project with Marc Dusseiller (Hackteria, 2012). It is a printed circuit board (PCB) that uses biofeedback [GSR] to control two stroboscopic LEDs. Holding the circuit to the eyes induces psychedelic visual effects and colourful, geometric fractal-like forms for many users. The first Fish-Brain-Machine was created for a workshop that took place during the Enki exhibition at Kapelica Gallery, Slovenia, 2012-2013. A second version of the PCB was produced for the Re-Mapping Perception workshops at Radiona (Section 4.2). The circuit design is based on a diagram of a Black ghost knifefish, a kind of electrogenic fish around which the original Enki project was based.

Exhibition link: http://antonyhall.net/blog/enki-pcb/

Appendix 10: Electronic Taste Perception workshop

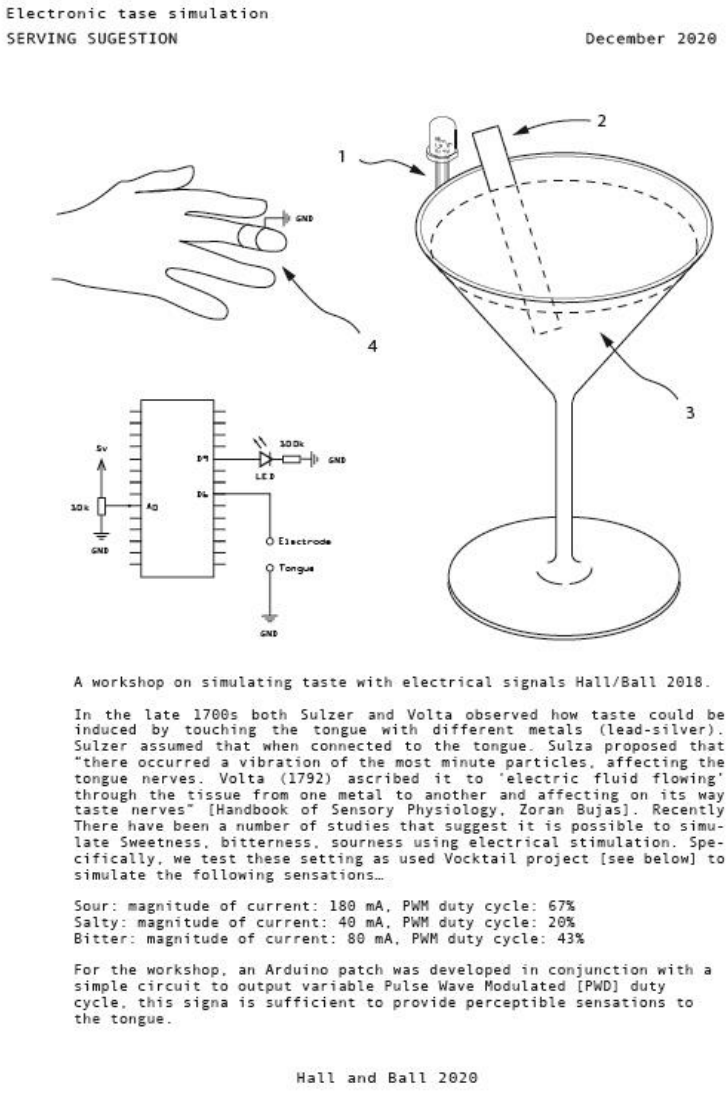


Figure 60: Electronic Taste Perception workshop, Hall and Ball.

This workshop is based on recent studies that suggest that it is possible to electronically simulate different taste sensations. For this workshop, a circuit was developed in collaboration with Chris Ball using Arduino-to-output signal (variable pulse wave modulated [PWM] duty cycle) via a circuit, assembled around a drinking vessel (such as cup or glass), and then completed via the tongue. Specifically, in the workshop we test these settings as proposed by Ranasinghe (Ranasinghe et al., 2017). We found our solution was sufficient to

provide taste-like sensations, such as tingling, fizzing, and metallic effects, to the tongue. Whether or not this matched the sensations as proposed by Ranasinghe was less clear.

Figure 60 gives an outline of our electronic taste perception experiment. This uses an Arduino to generate an electrical PWM signal (40-80 mA) from (D9); this is transmitted to a copper electrode (2) placed in the liquid (3). This signal is conducted through the liquid and makes a connection with the tongue (mouth or lips) through the body to a finger (3) connected to the ground of the circuit (GRD). The potentiometer (A0) adjusts the frequency of the PWM signal, which in theory can then simulate different kinds of taste. The LED output is provided so the circuit could be modified to include optical or sonic stimulation. See below link for the Arduino code.

Exhibition link: http://antonyhall.net/blog/taste-perception-experiments/

Appendix 11: On the Inwardly Generated Image (by Deformation of the Eyeball)

Extract from script for eyeball awareness and mental visualisation; to be performed lying on the back.

1 INSTRUCTION

Lie down.
Make yourself comfortable.
Keep your eyes open.
Think about the way you are seated/lying right now.

Where do you feel the pressure points?
How are you making contact with the floor?

Visualise your spine and how it sits. Is it bent / compressed?
Which parts make contact with the floor?

How is your head resting? Is it looking directly up, or to one side?

2 SCAN YOUR FACE

Relax your brow, bring you attention to the ears, to the nose, to the mouth.

Sense how the eyes are resting inside the eye socket.
Does it feel as if the eyes are resting in the middle, to the left, or to the right?

Now, bring your right hand into awareness.
Feel how its resting on the floor.

Note: What did you do with your eyes? Was there a shift? Did they, perhaps, look to the right?

Now, bring your left foot into awareness. Feel its weight on the end of your leg. Did your eyes respond?

Bring your awareness back to your hand, and back to your foot again. Did you feel your eyes respond this time?

2 CLOSE YOUR EYES

Now close your eyes.

The Czech scientist Jan Purkyně s wrote in 1819 ,"When I close my eyes, they begin to shine, just like the dots and lines," and "It all ends with a dark rhombus with blunt corners, surrounded by a dull shine resembling a phosphorescent light. A total darkness follows."

Does this match up with your experience?

Bring your hands to your head.

And place your palms over your eyes, leave space in the palm so it's not touching the eye. As you do this pay attention to the fact no light is entering your eyeball. Notice that there is no light coming into the eye.

What is interesting: now there is no light entering your eyes, yet your retina is still active and excited.

Pay attention to what colours and shapes you can see.

3 Eye Rotation

Bring your attention to your eyes. Can you sense them? Can you feel their weight agenised the back of the eye socket?

Before initiating a movement, think about which way you want to turn your eyes. Think about this for a while before initiating a movement of your choice.

Make a movement…then bring them back to the centre.

Gently rotate your eyes as slowly as possible.

Now rotate them in the opposite direction…

Antony Hall/Teresa Brayshaw 2019, 3/10 sections from half-hour scripted workshop activity (see Section 4.6 and Chapter 7).

Appendix 12 Experience in Progress Badge

Figure 61: EXPERIENCE IN PROGRESS, 35x50mm badge in 60×80 Foil printed box, text insert and authenticity statement / signed edition of 100

"This badge was made to celebrate a chance occurrence that has had a lasting effect on my work ever since. Back in 2006, I was working with electro-genic fish at the Centre des Neuroscience (CNRS) near Paris. Frustrated and stuck, I went for a walk, aimlessly wandering the corridors. I noticed a battered old red sign with white text hung over the door handle of a laboratory door saying "Experience en cours" (meaning "experiment in progress"). Later on the way back, I found the door was ajar. I knocked on it and peeped in. I ended up having a fascinating conversation with a scientist about how electric fish build an electrical image of their world. This set many chains of thoughts in motion and was the conception of the Enki project; Crucially, I began thinking about my work in terms of experience. I started involving human participants in the experiments as part of my work. This moment was a nexus point that ultimately led to a long term investigation of anomalous perceptual experience"

Workshop link:

http://antonyhall.net/blog/experience-in-progress/

Appendix 13: Tabletop Experiments Manifesto 2001-2021

A manifesto to celebrate 20 years of Tabletop Experiments, based on statement of practice, 2004.

1. The Tabletop Experiment is essentially amateur and DIY in its endeavour. It concerns science as recreation and involves the re-creation and re-invention of scientific experiments.

2. The Tabletop Experiment should ideally be conducted outside the laboratory or scientific contexts, and is assembled from items readily available in the home, the studio or shed, making use of domestic technology, kitchen utensils, aquarium parts pots, etc.

3. The Tabletop Experiment is based upon a specific behavioural phenomenon: an artefact of subjective perception, the interactions of liquids, or animals, for example.

4. The Tabletop Experiment forms a discrete environment: a device, or instrument, within which a unique phenomenon can exist. Ideally this should be a rapidly developed prototype, which affords an aesthetic interplay between materials and technologies, driven by incidental function and serendipitous accident.

5. These Tabletop Experiments, being susceptible to change within themselves and the environment that directly surrounds them, maybe precariously-balanced systems that demand to be sustained, maintained and nurtured: They should be a thing on the cusp of failure, for example, a vortex sustained in a coffee cup, turbulent patterns of oil on water, or the life of microorganisms in a single droplet of pond water, a phenomenon on the cusp of perception.

6. The Tabletop Experimenter should make time for the focused and extended experience of the phenomena. Make use of technologies to extend and expand observation through amplification, sonification, projection, and magnification.

7. The Tabletop Experiment must be an active process or an artefact of such.

8. Embrace failure.

Appendix 14: Participants / Workshops / Experiments Table.

Workshop	P# No.	Experiments				Notes sound / light	
CHI 1-1 experiments 2018		CHI	GANZ	MGE	NAV	Sound	
Participants studio	1	x				NA	
Participants studio	2	x					
MMU	3	x					
MMU	4	x					
MMU	5	x					
Whitworth Art Gallery	6	x					
Whitworth Art Gallery	7	x					
Whitworth Art Gallery	8	x					
Whitworth Art Gallery	9	x					
Whitworth Art Gallery	10	x					
Re-Mapping Perception 1	P No.	CHI	GANZ	MGE	NAV		
Group Workshop General Practice / Lincoln	x15	x5			x15	white noise	
Navigations (Whitworth experiments)	P No.	CHI	GANZ	MGE	NAV		
Whitworth Park	46				x	Natural sound	
	21				x	Natural sound	
Re-Mapping Perception 2	P No.	CHI	GANZ	MGE	NAV		
Radiona, Group workshops	x6	x6	x6			Stroboscope, no sound	
CHI experiments, Manchester Art Gallery	P No.	CHI	GANZ	MGE	NAV		
	x800	x800					
Middlewood Trust 11/08/2018	P No.	CHI	GANZ	MGE	NAV		
	41				x	Natural sound	
	42				x	Natural sound	
	43				x	Natural sound	
	44				x	Natural sound	
	34				x	Natural sound	
Re-Mapping Perception 3 FACT/LJMU	P No.	CHI	GANZ	MGE	NAV		
	11		x			Modulated White noise	
	12		x			Modulated White noise	
	13		x			Modulated White noise	
	14		x			Modulated White noise	
	15		x			Modulated White noise	
	16		x			Modulated White noise	
	17		x			Modulated White noise	
	18		x			Modulated White noise	
Developing HAPS 1-1	P No.	CHI	GANZ	MGE	NAV		
Studio	19		x	x		Modulated White noise	
Studio	20		x	x		Modulated White noise	GSR
Studio	21		x	x		Modulated White noise	
Studio	22		x	x		Modulated White noise	GSR
Home visit	16		x	x		Modulated White noise	GSR
Home visit	24		x	x		Modulated White noise	GSR
Re-Mapping Perception 4 Gallery 39, Cardiff.	P No.	CHI	GANZ	MGE	NAV		
	25		x	x		Modulated White noise	
	26		x	x		Modulated White noise	
	27		x	x		Modulated White noise	
	28		x	x		Modulated White noise	
	28.5		x			Modulated White noise	
Proximity, mirror gaze experiments, Venture Arts	P No.	CHI	GANZ	MGE	NAV		
	29			x	x	Modulated White noise	
	30			x	x	Modulated White noise	
	31			x		Modulated White noise	

	32			x		Modulated White noise	
	33			x		Modulated White noise	
Sum Total of All the Actions Rogue Artists' Studios Project Space	P No.	CHI	GANZ	MGE	NAV		
	34		x	x	x	Modulated White noise	GSR
	35		x	x	x	Modulated White noise	GSR
	37					Modulated White noise	GSR
	38		x	x		Modulated White noise	GSR
	39		x	x		Modulated White noise	GSR
	40		x			Modulated White noise	GSR
	49		x	x		Modulated White noise	GSR
Mirror gaze experiments Manchester Science Park	**P No.**	**CHI**	**GANZ**	**MGE**			
	50			x			
	51			x			
	52			x		Modulated White noise	GSR
	53			x		Modulated White noise	GSR
	54			x		Modulated White noise	GSR
	55			x		Modulated White noise	GSR
	56			x		Modulated White noise	GSR
	57			x		Modulated White noise	GSR
	58			x		Modulated White noise	GSR
	59			x		Modulated White noise	GSR
	60			x		Modulated White noise	GSR
Object Without Perception Virtual / Proximity CV/19 edition	**P No.**	**CHI**	**GANZ**	**MGE**			
	29		x				
	30		x				
	61		x				
	32		x				
	62		x				
Virtual (Obscurist edition)	24		x				

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