

**ALAN DUNNING
PAUL WOODROW**

Paper: **MACHINE IMAGINATION: CLOSED EYE HALLUCINATION AND THE GANZFELD EFFECT**



Abstract:

This paper reflects upon and interrogates an artwork that explores the internal unattended workings of a machine through an implementation of the Ganzfeld Effect and Closed Eye Visualization. The work explores ideas about generative machine vision and how it gives rise to unbidden and unexpected images and patterns in streams of unstructured data. Through an examination and analysis of visual system noise expressed as spatio-temporal voxel volumes, the work explores the product of these investigations as machinic hallucinations.

Topic: Art

Authors:

Alan Dunning
Alberta College of Art + Design, Canada
www.acad.ca

Paul Woodrow
University of Calgary
Department of Art, Canada
www.ucalgary.ca

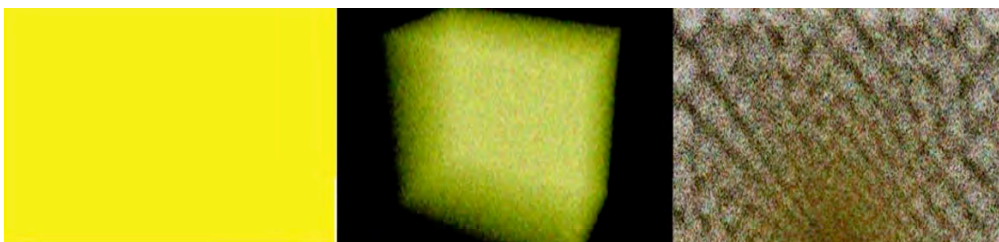
Using a classic Ganzfeld effect [1] experimental apparatus, a monochromatic colour field, undifferentiated by tone or hue is analysed for tiny inconsistencies in the colour field. Invisible to the human eye, these inconsistencies are tracked, built as voxel volumes, and analysed and sampled as they pass across multiple planes in the volume.

Over time patterns gradually emerge as the sampled frames are accumulated and are multiplied together. What starts as pure noise gradually resolves itself into patterns with structure and form. The patterns that emerge bear a striking resemblance to patterns that are normally associated with those seen in closed eye hallucination and Ganzfeld effect experiments in which subjects stare for long periods at monochrome uniform fields of colour.

Past work has investigated the relation between perception and memory where memory is characterized as an index. New work suggests the possibility of using machines and their generative interiorities (subjectivities) in a phenomenologically driven investigation to discover hallucinatory tendencies that can create false memories.

References:

[1]
http://en.wikipedia.org/wiki/Ganzfeld_effect



Contact:

alan.dunning@acad.ca

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ColourBlind: Machine Imagination, Closed Eye Hallucination and the Ganzfeld Effect

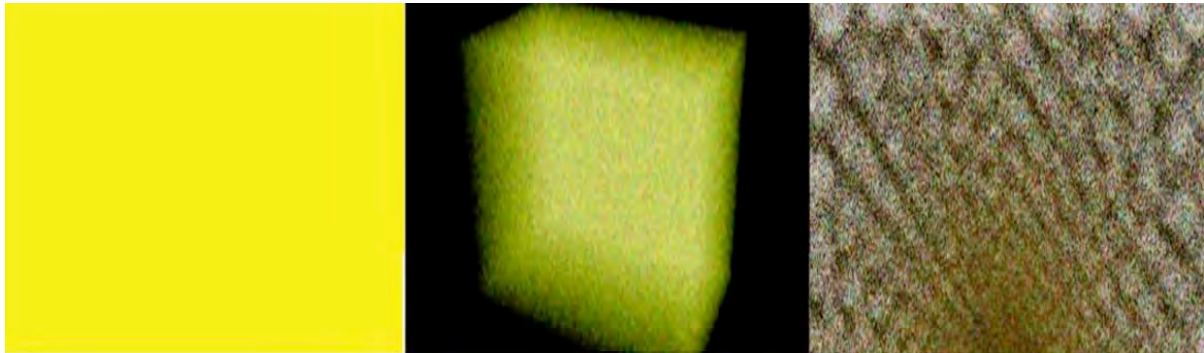
Alan Dunning

*Media Arts + Digital Technologies, Alberta College of Art + Design, Calgary,
Canada*

*Department of Computer Science, University of Calgary, Canada
email: alan.dunning@acad.ca*

Paul Woodrow

*Department of Art, University of Calgary, Canada
email: pwoodrow@ucalgary.ca*



ColourBlind, 2010, installation view

Premise

The Einstein's Brain Project is a group of scientists and artists working together to develop installations and environments exploring ideas about consciousness and the new constructions of the body. Recent work has used strategies taken from paranormal science and psychology to explore how interpretation in shared machine-human environments contributes to the construction of our worlds.

The paper briefly introduces and contextualizes a new, developing work – *ColourBlind* - that explores the internal workings of a machine through an implementation of the Ganzfeld Effect and Closed Eye Visualisation insofar as they relates to ideas about hallucination in human and machine hybrids. The work explores ideas about machine vision and how hybrid interpretation gives rise to unbidden and unexpected colours, images and patterns in streams of unstructured data, and how undifferentiated monochrome colour can affect interpretation imagination. Through the inspection and analysis of visual system noise expressed as spatial temporal voxel volumes, the work considers the product of these investigations as machine hallucinations.

1. INTRODUCTION

In recent times the development and dissemination of computer generated imagery has made commonplace constructed visual spaces that are fundamentally different from the mimetic and naturalistic representations of traditional media like painting, photography and film. But it is the increasing prevalence of machine and computer vision, and seeing machines, which has produced the most radical shift in the manner in which the world is perceived and constructed. This habitual employment of technological devices and programs has reconfigured both our conceptual and perceptual frameworks to the extent that what might be called natural vision is beginning to be superseded by machine vision. This suggests that vision is becoming disengaged from human needs and is now transferred to a technological plane.

The Project's exploration of hybrid perception and interpretation in shared machine-human environments concentrates on the idea that any visualization is a complex expression and indication of internalized machinic activity. In previous work we have been forced to acknowledge that our visualizations are constructs that are not uniquely related to the information that generates them. They are a complex hybrid of machine analysis, human interpretation, and scientific and artistic vision, which promotes a remapping of information beyond its immediate functional value. The drive to fill in the spaces opened up by those parts of an entity that resist their informational links, produces what we might only think of as false positives, but in doing so brings into focus acts of cognition that are inextricably linked to the building of meaning, the understanding of narrative, and, in turn, to the techno-subjective restructuring of the body.

The Ganzfeld Effect



Ganzfeld modified CCD

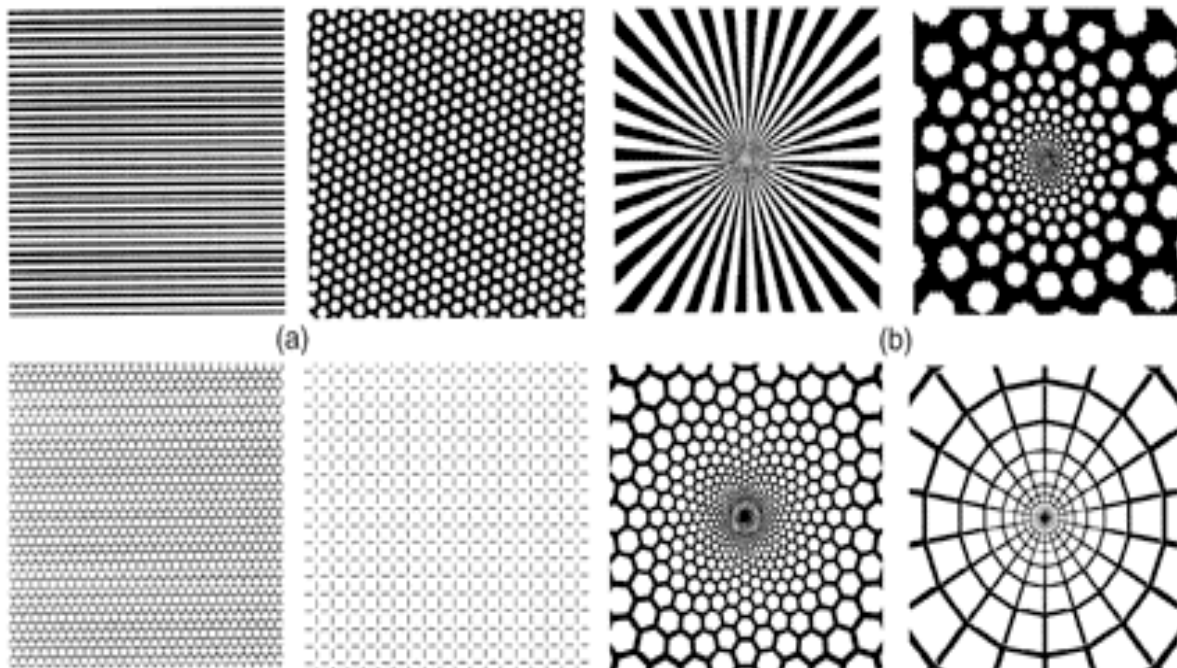
The Ganzfeld (complete or open field) effect [1] is a phenomenon of visual perception caused by staring at an undifferentiated and uniform monochrome field of colour. Usually this is accomplished by the subject wearing tight fitting goggles that block out all but one colour of the spectrum. In the 1930s psychologist Wolfgang Metzger, investigating gestalt theory, established that when subjects gazed into a featureless colour field they were unable to see anything after even a few seconds. In further experiments subjects that are immersed in the monochrome field for extended periods of time consistently hallucinated and recorded distinct EEG patterns of activity.

It is a well-known phenomenon with historical precedents in the followers of Pythagoras entering

dark caves to gain wisdom through visions [2], and in reports of trapped miners hallucinating and seeing ghosts. Similar experiences are often cited by Arctic and Antarctic explorers who report altered states of mind while travelling across large featureless landscapes.

It is thought that the hallucinations in extended Ganzfeld experiments are the result of the brain amplifying neural noise in order to look for the missing visual signals, and it is this noise that is interpreted in the higher visual cortex, giving rise to hallucinations.

A Ganzfeld experiment is a technique used in the field of parapsychology to test individuals for extrasensory perception. In the context of *ColourBlind* its similarity to scrying – an ancient system of revelation through prolonged observation of an object - should be noted. Martin Howse's experiments in scrying, in so far as they relate to our electronic environment and the revelation of a hidden world [3] have particular resonance, as does Friedrich Kittler's exposition on the electro-mysticism of Thomas Pynchon's novels. [4]



Patterns typically reported in CEH

Closed Eye Hallucination

In Closed Eye Hallucination an individual sees blobs, colours in motion and sometimes objects, even though the eyes are closed. Closely linked to the experiences of subjects in Ganzfeld experiments there are often patterns discovered within the blobs – most cited are webs, grids, honeycombs and other geometric and repeating structures.

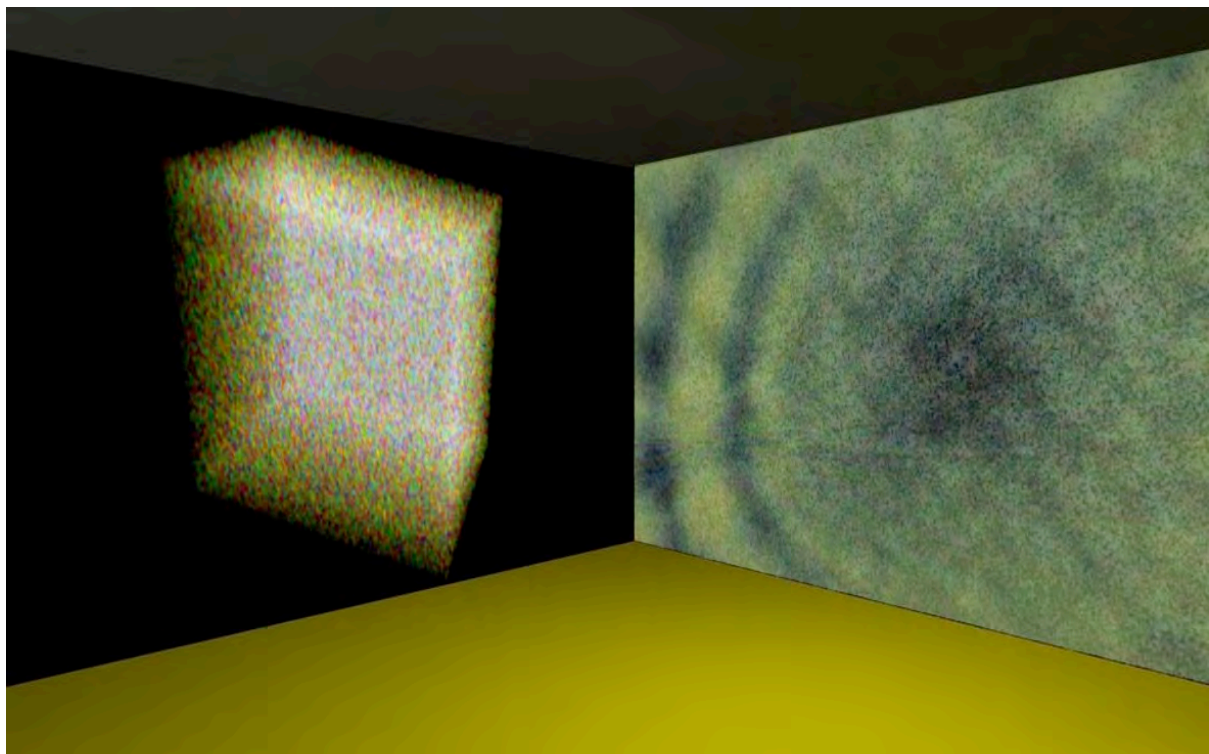
CEH experiences can take a number of forms: visual noise - seemingly random noise of pointillist light/dark regions with no apparent shape or order; light/dark

flashes - regions of intense black or bright white that appear in the noise; patterns – highly organized motion and colour forming complex geometric patterns and shapes; and finally objects and things.

ColourBlind

A camera is turned on, covered with a single Ganzfeld goggle [5] and bathed in a pure yellow light. The only light passing to reach the camera's CCD is yellow light of 570 nm. The video stream is sent to a computer where the input is cropped and adjusted for fall-off at the edges of the camera so that the monochrome colour field is undifferentiated by tone or hue. The camera image is processed in Max/MSP to construct a voxel volume that is analysed for optical features within a specified region of interest. Tiny inconsistencies in the colour field, invisible to the human eye, false positives if you will, are tracked as they pass across 3 planes in the x, y and z dimensions of the volume. These inconsistencies are amplified and rendered as pixels on a video plane that becomes increasingly densely populated through additive blending.

This video plane is streamed to a projection on the wall. Over time patterns gradually emerge as video frames are accumulated and multiplied together. Two other screens show, in turn, the light that is seen by the camera and the volume of data that contains the analyzing planes. What starts as pure noise gradually resolves itself into patterns with structure and form. Sometimes these form rapidly, but usually these are the results of many layers of noise blended together over very long periods of time – days and weeks.



Visualisation of emerging pattern

The patterns that emerge bear a striking resemblance to patterns that are normally associated with those seen in closed eye hallucination and Ganzfeld effect experiments in which subjects stare at monochrome uniform fields of colour. Most often loose grid-like patterns with regularly spaced nodes emerge first, to finally resolve themselves as lines radiating out from single focal point. The patterns take the form of organised blobs that develop into lines and patterns. Usually asymmetrical they still retain enough symmetry to suggest cobwebs, wheels or mazes that recall many descriptions of hallucinations experienced during Ganzfeld experiments.

The inconsistencies in the field come from the image sensor itself, and the quantization processes at work in the patch, but the patterns that emerge suggest that there are unseen structures embedded in the streams of data that surround us and feeds the imagination that is at the heart of the Project's work on hybrid cyborgian systems of representation and interpretation.

A CCD is an electronic photon detector, converting photons into electrons, as photons strike each pixel of the device. The number of electrons amassed in each pixel is directly proportional to the number of photons that strike the pixel, and indicate how dark or light each particular pixel should be in an image file. Theoretically, each and every photon would be converted into one electron, the number of electrons indicating exactly how much light struck each pixel. However, thermal noise, amplified background electrical noise, and the fact that not all pixels in a CCD have the same sensitivity to light, introduce variations that affect the representation of the image.

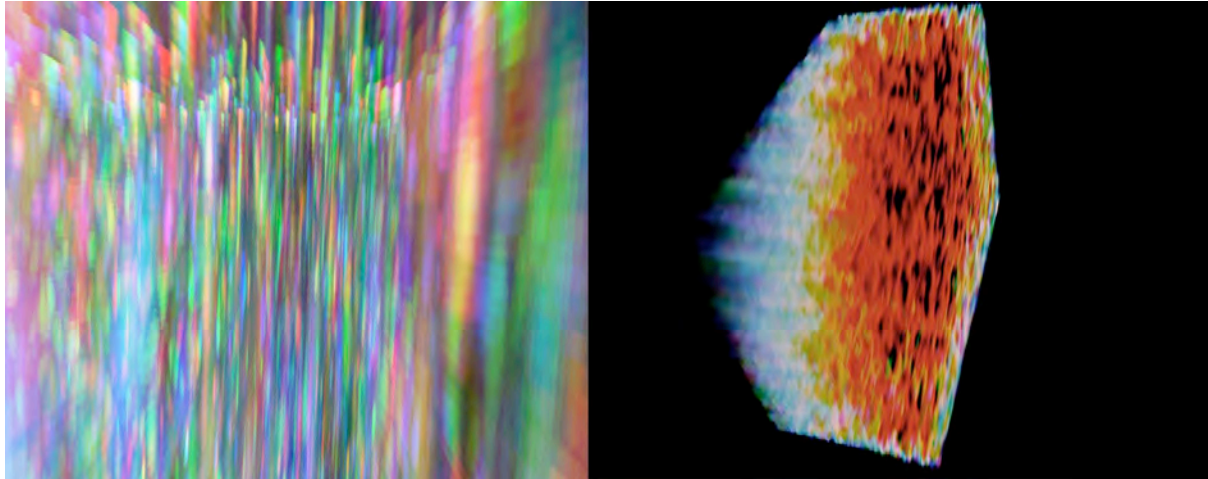
Noise in these images manifests itself in many ways; grain in dark areas, horizontal or vertical lines visible in low signal areas of the image, blotchy gradients between darker and lighter areas, gradients from one edge of an image to another.

The introduction of noise into an image creates numerous fictions, and the link to direct representation is attenuated. At the extreme a noisy image is a fiction filled with hallucinatory elements. It is these hallucinatory elements and their consequent fictions that form the patterns in the work. But their fictive character is moderated by their lack of any indexical, physical relationship to reality.

The installation is a generative, closed system. An algorithm looks for any disruption in a uniform field of colour. Any pixel values that fall outside a finite and limited range are stacked additively on previous instances of disruption. Over time there are many, many instances of the tiniest of ruptures in the visual field that, multiplied together, begin to organize the previously vacant colour field. These patterns are nothing more than the chance interaction and collision of one slight variation in pixel value with another, but the Project's interpretation of them hints at an analytic that forms in the interstice between machine and body within pattern and information flows, as the brain's xenophobic response to absence and randomness.

The patterns that emerge from the random flickerings in the machine hint at an

immaterial hybrid body that exists in the pattern and information flows that were fusion of body and machine, suggests that there might be real information contained within the random noise of the work, but its lasting impression is to acknowledge an ontological anxiety that imagines a remembering body so inextricably enmeshed with its surroundings and the technologies that support it, that it becomes indistinguishable from the processes, systems and mechanisms of storage and distribution.



Tracked pixels accumulated over time

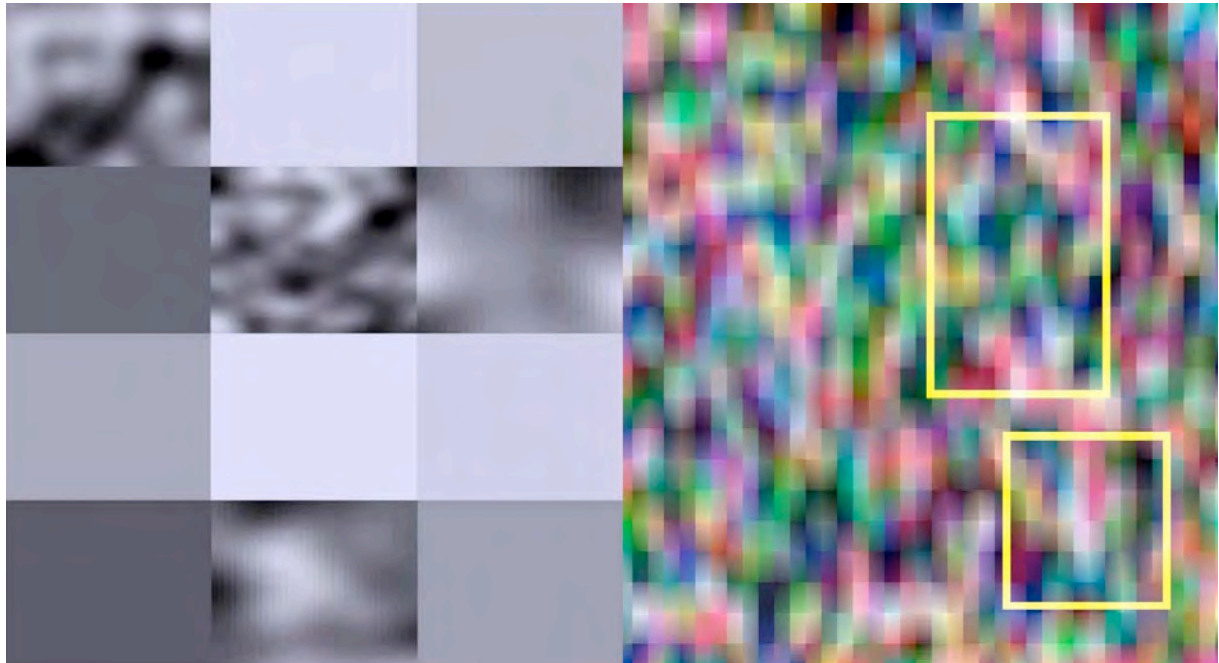
But the real question is whether machines can imagine too, whether in the darkness there is anything that might cause the machines to see as humans do - to see things where there are none and to recognize within these visual mistakes optical and aesthetic possibilities? [6]

Previous Work

Earlier work used ideas found in *Electronic Voice* and *Video Phenomena* to explore ideas about presence and absence, and pattern and randomness. Installations took the form of blinded cameras that sent visual and audio noise to a computer that analysed it for patterns that looked like human faces and sounded like human speech.

In these installations the computer did the hard work of analyzing complex data, but the task of meaning making was left to the observer. Algorithms that found faces or human speech in the data stream found many barely meeting the requirements. The interpretation of noisy pixels as faces, or noise as speech was left to the observer. On occasion these faces and voices were utterly convincing. They were, to all intents and purposes, real faces, real voices. They were not images of people, but another kind of image loaded with meaning, which arose accidentally, but irresistibly, from the hybrid interaction between machine and body. To all intents and purposes when these patches of pixels looked like faces, they *were* images of faces.

The faces and voices that emerged from the random flickerings in a machine hinted at an immaterial hybrid body that existed in the pattern and information flows that were fusion of body and machine, suggesting that there might be real information contained within the random noise of the work.



Ghosts in the Machine, Mexico 2008

Later work extended these ideas by organising noise and its visual equivalents as spatio-temporal volumes to enmesh an observer in a stack of noise slices, delivered by directional speakers. These works used pattern recognition algorithms to identify unusual repetitions, noticeable clusters, loops and so on, in concert with a moving observer who gave form to shapes and sounds. Enlarged to architectural scale an observer is enveloped by volume of noise slices, delivered by directional speakers. The observer gives form to shapes and sounds that might seemingly only have an attenuated indexical relationship to the data. These works form the beginnings of a new means to develop installations and visual systems that use the relationship between an observer actually within the data to build a picture of the machine/human that is the mediatized body.

It is this work that informs the recent exploration of pattern emerging from a monochrome colour field.

Conclusion

The work of the art and science collective the Einstein's Brain Project has long been closely associated with issues surrounding memory, time and the means by which we access the past. In particular, works that have been engaged with the deep analysis, through pattern and feature recognition, of information accreted over long periods of time, have contributed to a core understanding of memory as

a shared construction between machine and human. In these works the task of archiving the data has been consigned to machine memory, but analysis and interpretation has remained with the human element in the symbiotic, cyborgian systems that constitute the works. The relationships between time, human interpretation and distributed and archived memory, together with the irresistible shifts that occur in the false continuities of reconstruction, have suggested new ways to consider memory and the body as its instantiating agent, as is increasingly distributed throughout a diffused and expanding world. They suggest that memory may not only be discrepant - dynamic and neomorphic - but also more purely hallucinatory and more bound up in the complex processes of remembering that lay beyond both the recall of persistent memory, and the paroxysm of involuntary memory.

In ColourBlind very large amounts of data culled from noisy colour streams are processed in attempts to perceive pattern and form in apparently random streams, or in undifferentiated monochrome fields of colour. Extremely large amounts of data are written to disk and analysed both in real time and after the fact. In each work, the task of archiving data is consigned to a machine, with analysis occurring in the interstice between machine and human as both attend to the task of searching for pattern. What the analysis reveals is that patterns and forms assert themselves that are neither properly in the data nor indexed elsewhere. While representing the data exactly, these forms arise through simple differences that recalls Deleuze's notions of difference intensity:

Every phenomenon refers to an inequality by which it is conditioned. Every diversity and every change refers to a difference that is its sufficient reason. Everything which happens and everything which appears is correlated with orders of differences: differences of level, temperature, pressure, tension, potential, difference of intensity. [7]

Simple differences in tone, or colour or hue result in a morphogenesis based on emergence, on becoming and driven by intensity differences. The machine archive – machine memory – contains its own mechanisms for generating form from within. Unexpectedly, machine memory suddenly appears less finite, less closed to discrepancy than first imagined. Form and pattern is generated through the very intensities of difference that are the quintessence of code - ones and zeros. It is as if algorithmic access to an archive – machine memory if you will – is, and must be, fundamentally hallucinatory.

All of the Project's pattern recognition work has much in common with the psychic spectres of Abraham and Torok [8], Jonathon Crary's bodies [9], and with recent explorations into sonic hauntology [10], particularly in its investigation into changing ideas about what constitutes authenticity, and with earlier explorations into EVP [11], but its lasting impact is to acknowledge an ontological anxiety that imagines a body so enmeshed with its surroundings and the technologies that support it, that it becomes indistinguishable from the mechanisms of its representation and disappearance.

The work of Einstein's Brain Project explores machine vision and computational

analysis to examine a machine's interiority – its phenomenal self-model. The question remains: where is this model to be found? It is not located within the artifacts themselves and neither is it properly located within the machine. It is the product of a relation. Past work has investigated the relation between perception and memory where memory is characterized as an index. New work suggests it is possible to use machines and their interiorities (subjectivities) in a phenomenologically driven investigation to discover hallucinatory tendencies that can create not only false memories, but machine imagination.

Increasingly our machines see and discriminate much as we do, and in turn change our perception of the world. ColourBlind explores ideas about how we and machines see and experience the world, and raises questions about the capacity of both to discriminate. In the search for pattern in randomness, for colour where there is none, when faced with the *horror vacui* of sensory deprivation the brain, and in this case the machine, continues its processing regardless, creating its own colours and forms as interpretative hallucinations, as part of a grid of a memoriously relational world [12]:

In his electro-mysticism, the triode was as basic as the cross in Christianity. Think of the ego, the self that suffers a personal history bound to time, as the grid. The deeper and true Self is the flow between cathode and plate. The constant, pure flow. Signals - sense data, feelings, memories relocating-- are put onto the grid, and modulate the flow. We live lives that are waveforms constantly changing with time, now positive, now negative. Only at moments of great serenity is it possible to find the pure, the informationless state of signal zero." [13]

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- [3] <http://1010.co.uk/org/scrying.html>, (accessed November 2006).
- [4] Kittler, Friedrich. *Pynchon and electro-mysticism*. In *[the] xxxxx [reader]*, Joost Rekveld, 2006
- [5] There are goggles of various kinds available, but simple Ganzfeld goggles can be made from the two halves of a ping-pong ball.
- [6] Ted Hiebert, in conversation with Alan Dunning and Paul Woodrow, Calgary/Bothell, 2009
- [7] Deleuze Gilles, *Difference and Repetition* (Columbia University Press, New York, 1994), page 222
- [8] Abraham, Nicolas and Torok, Maria. *The Shell and the Kernel*, Chicago: University of Chicago Press, 1994.
- [9] Crary, Jonathan. *Techniques of the Observer: On Vision and Modernity in the Nineteenth Century*, Cambridge: MIT Press, 1990.
- [10] From 1995 onwards, the term hauntology has featured prominently in the British music press and blogosphere. The first to use the term were Ian Penman

in *The Phantoms of Tricknology versus a Politics of Authenticity*, in *the Wire*, March 1995, and David Toop in *Haunted Weather: Music, Silence, and Memory*, *Serpent's Tail*, London, 2004. The term has been used by k-punk, Woebot, Simon Reynolds and Pádraig, amongst others, to discuss dubstep artists such as Kode9 and Sam Shackleton. The *Hauntology Now!* symposium took place in 2008 at the *Atmospheres2* festival at the *Museum Of Garden History* in London.

[11] In addition to paranormal investigations there have been numerous artistic explorations over the years, including Joe Banks' *Rorschach* audio project, and work by Leif Elggren, and Carl Michael von Hausswolf amongst others. *Ghost Orchid* (compiled, edited and produced by Justin Chatburn and Ash International) provides an in depth look at EVP.

[12] [Moraru, Christian, *Memorious discourse: reprise and representation in postmodernism*], Fairleigh Dickinson University Press, Madison, 2006

[13] Pynchon, Thomas, *Gravity's Rainbow*, Penguin USA, NY, 1995