

The Affect of Quantum Phenomena on Media Art

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Abstract

This panel will deal with art, media and science via the concept of the *'spin'* as a fundamental in quantum research where flux and vibration are at the very core. The historical model of media art, science and technology must now include the potential of the quantum phenomena through the emergence of the quantum computer. The subatomic world tantalises us with startling phenomena, but lies deep beneath the surface of human experience, forever hidden from direct observation. Data captured through complex physics experiments reveal quantum behaviours, but unlike scientific meanings constructed to objectively explain such phenomena, the panel will explore the interactions between the subatomic and human realms. In the words of contemporary physicist Anton Zeilinger, this data from quantum experiments exists in a state of "primary reality" more fundamental than the meanings scientists construct to explain it [1]. The panel will reflect how media art will have to deal with significant change based on the discoveries being made in controlling atoms at the core of new machines, including the quantum computer. The panel's intuitive and insightful presentations will demonstrate how we as humans comprehend and understand the world at the deepest level and by doing so bring it into existence.

Mike Phillips: Touchy-feely

This paper will explore the emergence of a post-ocular culture created by the ubiquity of lensless sensing technologies that manifest the things that lie outside of the normal frames of reference. The hegemony of the eye, which for centuries has defined how we know the world, is fading. The invisible and obscured, the infinitely big or nanoscopically small, hover on the fringes of our collective cultural perception, things we have always known were there but never witnessed. This unseeable (im)material world has traditionally languished in the domains of the paranormal or the spiritual - forces so delicate that they require a leap of faith to believe that they are actually there. Whilst our science readily embraces this domain (stumbling around in the sub-molecular dark, lurking between atoms, feeling its way through the atomic forces that bind matter) our cultural philosophy struggles to believe and clings nostalgically to lens-based media-technologies for knowing and capturing the world.

The comfort zone created by this nostalgia was shaken by the death of film, marked by the bankruptcy of Eastman Kodak (2010), and the shift to the post-ocular. Ironically underlined by Fujifilm's move, in the same year, of its film production to nano-technology development. The transmogrification of the collagen used for film production into a nano-material for beauty products (Pico-Collagen) [3] marked not only a technological shift from film grain to nanoparticles, but also signalled a cultural shift - the dissolving of a historical instrument for knowing the world, into the very material of the world. Worse still, this nostalgic instrument was dissolved into the face of the viewer, a dissolution of object and subject. To know the world in this post-ocular culture we need to constantly (re-)negotiate the fragility of our material reality. The act of seeing is fundamentally part of our perceptual problem, and the trans-scalar collapsing of the view from the Albertian window so culturally traumatic. A trauma that finds its peak in the Quantum computer.

And yet, somehow, when we close our eyes, we know that there is something there, some sense of the world beyond the ocular. We can trace this sense through multiple historical precedents, such as: the concept of Atomism date back to the 4th Century and span the ancient globe; the dea of the 'Mote', both a noun and a verb, its early Christian origins and Masonic overtones describe the smallest thing possible and empower it with the ability to conjure something into being (So mote it be...) - "A mote it is to trouble the mind's eye." (Shakespeare ca. 1599) [4]; and the work of technospiritualists, such as Professor Gustav Adolf Schwaiger, the technical director of the Austrian Broadcast Corporation, and his collaboration with famous medium Rudi Schneider in the 1930s hint at a desperate need to know the invisible.

The paper presents a number of works created by the author which (re-)negotiate the fragility of our (im)material world. These include experimental approaches to capturing, synthesizing, and re-visioning the world by data visualisation and sonification, methods of capturing and sampling through Magnetic Resonance Imaging (MRI), Lorentz forces and Atomic Force

Microscopy (AFM). This transdisciplinary research embraces the problems of the trans-scalar, the nature and substance of matter, and our relationship to it. To see another world in a grain of sand, to conjure up images of the dead, it is our tenuous cultural relationship with these emergent technologies that troubles the mind's eye.

Chris Henschke: The Edge of the Singularity

In my paper I will discuss my practice with art and particle physics, focusing on the panel's central theme of "Singularity". I will argue that the "singularity", a point with no dimensions, cannot exist in any meaningful sense as as a physical entity, yet it underpins much of quantum physics. Although it is a hypothetical entity, yet which becomes more manifest as we get closer to it, it will never be fully realized. I believe that the singularity can be understood as a "coherent" entity, to borrow from the concept of "quantum coherence" – in the interaction between the coherent entity and the physical world (i.e. as soon as we attempt to measure it) it "decoheres" from a theoretical form into the physical forms of space, time, energy and matter. Like Zeno's arrow, the nearer we get to the singularity, the harder it becomes to get there.

I was inspired towards this position whilst undertaking an "art@CMS" collaboration at the Compact Muon Solenoid (CMS) detector at CERN. During my time at CERN I heard (as yet unsubstantiated) rumours from the coalface of the Large Hadron Collider, that the recently discovered Higgs Boson (a.k.a. the 'God Particle'), postulated as the most fundamental particle, may actually be a composite entity, made up of other higher energy particles. This empirically suggests the concept that the journey towards the "singularity" is like a Zeno's arrow of ever-decreasing scales and increasing energies.

I will augment my discussion by presenting one of my projects, *Edge of the Observable* (2014). This is an audiovisual artwork that explores the limits of materiality and knowledge through an experimental manifestation of data taken from experiments at CMS. The work seeks to manifest the sublime and dynamic parameters of particle collision event data by enhancing the formal material and energetic qualities of such data, using an experimental optical physics setup I developed. This enhances the area in the core of the collisions, which is a tiny black void-like sphere, technically termed the 'vertex of kinematic undetectability'. Like the event horizon around a black hole, we can see the dark edge of its form but perhaps never access its heart. Thus the "singularity" becomes a symbol of our striving for ever-increasing knowledge, pulling us ever closer towards what is an ultimately unattainable goal.

Frederik de Wilde: Creativity and imagination in the history of art and physics

The connections between art and science, and the potential outcome of cross-linking both, are of great interest. In this paper I will explore the creative potential of hacking the substrate of the Universe and quantum noise. Art and science should each be evaluated on their own merit, and both are equally important in our quest to understand our world and to enrich our experiences. For the author physics is one of the greatest mysteries of them all, the mystery of understanding the fabric of reality. Creativity and imagination are enormously important in the history of physics because often the hardest part has been having creativity and imagination to question assumptions that everybody else has bought into. Imagination is crucial for imagining how things could be different. The author uses his artistic praxis, art historical knowledge and keen interest in the sciences as a starting point to explore the notions of the hole, randomness, true random number generation, quantum physics, the vacuum and vacuum noise. The first part of the talk explores scientific concepts; the second part focuses on the arts and artistic output. By setting up a lab experiment to measure quantum fluctuations and applying mathematics in custom made software, the author discusses visualizing the invisible by materializing his subjects through 3D printing.

Paul Thomas: Quantum Media Art and its new modalities

This paper will deal with art, media and science via the concept of the spin as a fundamental property in quantum computer research, where flux and vibration are at the very core. The historical model of media art, science and technology now includes the potential for quantum phenomena.

I will look at the implications of quantum computing for media art and its evolving histories. I will argue that new forms of art are on the horizon that demand specific attention as we enter an age of experimentalism. The spin of the atom in the void, with its internal rhythms and vibrations, is the driving force behind the power of the quantum computer. The various media artists whose practice parallels progress in the area of physics are exploring frequencies and signals that are key properties at the atomic heart of quantum mechanics. The human interface with technologies will become more complex with the rise of the quantum computer and its ability to process multiple sets of data simultaneously. The controlling of atoms at the core of the computer will require a shift in our human relationship with matter, and artists can play a leading role in defining this new relationship through reflection and critique of computer-mediated interactions.

The quantum computer uses traditional atomic material compounds such as phosphorous, nitrogen, silicon and graphene electrons as qubits and their properties of the superposition. The paradox of the quantum superposition (best articulated in the Schrodinger's Cat thought experiment) exists as an actual and empirical condition in which an electron occupies multiple positions in space simultaneously, but none specifically. There is a shift that needs to occur in our conscious understanding of invisible quantum nature. How will quantum phenomena affect our understanding of materials, meaning and art?

References

- 1 Anton Zeilinger, *Dance of the Photons, from Einstein to Quantum Teleportation*, (New York: Farrar, Straus and Giroux, 2010), p. 236.
- 2 Anton Zeilinger, *Dance of the Photons*, p.235.
- 3 Pico-collagen (acetyl hydroxyproline), <http://and-fujifilm.jp/en/html/skincare/index.html> [Accessed 25, March 2012].
- 4 William Shakespeare, *Hamlet*, Act 1, Scene 1, Line 129. <http://shakespeare.mit.edu/hamlet/full.html> [Accessed 25, March 2012].