

# Consciousness, quantum mechanics and the Metaphase Typewriter revival project

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*I make artwork that engages with quantum mechanics to enable the viewer to doubt conventional reality. Quantum mechanics gives significant cause to doubt conventional reality. Rather than reality being knowable, objective and mind-independent, one quantum theory poses the confronting possibility that reality is brought into existence through observations, even, controversially, by consciousness. My 'mind works' projects, one of which is the Metaphase Typewriter revival project, enables a viewer to doubt conventional reality. Specifically, the 'mind works' projects do this by providing the viewer opportunities to interact with events of quantum superposition, using only consciousness, to arguably affect or even create material reality.*

Since 2009, I have been making mixed media artworks based on concepts of quantum mechanics. My PhD research examines how visual art that engages with concepts of quantum mechanics can enable a viewer to doubt knowable, mind-independent, objective reality. As a specific part of that research, my 'mind works' projects [1] make a substantial assault on ideas of conventional reality. They suggest the possibility that there is a primary role for the observer in obtaining information about the world. Further, based on some accounts, they suggest that that the observer's consciousness could be the agency by which fundamental quantum particles move from states of superposition into material reality. [2]

The basis for this claim is that, they provide actual quantum random events [3] with which the viewer can interact to affect or, arguably, create material reality. The viewer has an immediate sense that if their own consciousness can affect or create material reality, then

conventional reality must be more than an objective, material, mind-independent world. The 'mind works' projects represent both metaphorically and, arguably, literally physicist John Wheeler's idea of a 'participatory universe'; that we participate in creating the reality we experience. [4] In this sense, it could be said that conscious observation equates to physical matter. The 'mind works' projects present opportunities for the viewer to directly interact with them, allowing expectations of conventional reality to be potentially ruptured. I have undertaken three separate 'mind works' projects. The first of these, and the subject of this paper, is the Metaphase Typewriter revival project.

## **Background to the Metaphase Typewriter revival project**

Quantum mechanics is the fundamental explanation of how physical matter is created and behaves at the subatomic scale. It is the basis for the explanation of the scheme of things in our universe. However, it is totally at odds with our usual experience of a 'conventional reality' that is knowable, mind-independent and objective. [5] The quantum world forces us to see that reality is a concept much broader than one simply based on our own perceptions; a world that is, possibly, much more subjective and relative than we realise and one that may be interconnected in ways that we cannot yet conceive.

In part, my research into how visual art that engages with quantum concepts, might enable a viewer to doubt conventional reality, aims to respond to a decades-long call from parts of the scientific community for a re-evaluation of 'conventional reality'. [6] This call is based on the fact that quantum mechanics conflicts with the notion of a



Figure 1. Lynden Stone *Metaphase typewriter revival project* 2012, Geiger counter, gas lamp mantle, laptop, program, Perspex cover, dimensions variable, installation view. Photograph by Carl Warner.



Figure 2. Lynden Stone *Metaphase typewriter revival project* 2012, detail of Geiger counter



Figure 3. Lynden Stone *Metaphase typewriter revival project* 2012, installation view

knowable, mind-independent reality in fundamental and shocking ways. In contrast to the macroscopic conventional reality I perceive, in the subatomic quantum world there is no physical matter as I understand it. Rather, according to the accepted formulation of quantum mechanics, pre-material states of connected multiple possibilities (states of 'superposition') exist. These superposed states, according to conventional views, are collapsed and brought into definite states of singular material reality through observation or measurement. [7] Rather than reality being knowable, objective and mind-independent, quantum theories pose the confronting possibility that there is a quantum realm imperceptible to and unknowable by me and that the reality I experience is brought into existence through my observations, even, controversially, by my own consciousness. [8]

In the macroscopic world we live in, we do not readily observe quantum superposition; [9] it appears to have collapsed into single material actuality. The process of how and why quantum superposition collapses (if, in fact, it does) is not presently understood by science. Various theories of how the quantum superposed state of multiple possibilities resolves into a single state of actuality that we experience can be grouped into two propositions: either quantum superposition does collapse or it does not. The main competing collapse theories propose that collapse is caused by either the act of measurement or observation (regarded as the orthodox theory of collapse)[10] or the specific mind or consciousness of the observer,[11] or by mixture with the macroscopic environment (without the necessity for an observer).[12] This last theory of environmental collapse attempts to retain some level of physical objectivity into the idea of quantum mechanics but the mechanism for this collapse theory is yet to be satisfactorily explained and increasing experimental results in demonstrating quantum superposition at scales now readable with the naked eye [13] means the line between superposition and collapse is unclear.

If observation or measurement causes

collapse of pre-material quantum superposition into physical reality, then quantum theory is an empirical theory and there is no physical reality beyond observation and measurement.[14] Some mathematicians, physicists and theorists have extended this theory to suggest that the agency of the observer's mind or consciousness causes quantum collapse.[15] Further still, a highly controversial theory by a handful of physicists proposes that consciousness is the method by which quantum superposition collapses into singular material reality.[16] Accordingly, it is possible that through our consciousness we have a fundamental role in creating material reality.

### **The Metaphase Typewriter revival project**

In the Webb gallery at the Queensland College of Art, Brisbane, a laptop, its keyboard covered with black Perspex, is installed on a plinth. The viewer approaches the laptop screen, drawn in by its sound, a blinking red light and continual lines of green "0"s, "1"s, numbers and text arriving at the bottom of the screen. Eric, one of the laptop's the text-to-voice readers sonorously announces the lines of words that appear against a black background. The Perspex reflects the lines of numbers and text. A constant clicking accompanies the appearance of the '0's and '1's. In front of the laptop, a silver box contains a gadget with a blinking red light. The viewer reads a notice affixed to the wall:

*Use your mind to affect the output of words and sentences.*

*Concentrate on the output of "0"s and "1"s being generated at the bottom of the screen. Relax and be confident that you can affect the generation of these numbers to produce the words you want.*

The *Metaphase Typewriter revival project* (2012) (figures 1, 2, 3, and 4) offers an opportunity to the viewer, through interacting with quantum random events, to test the idea that consciousness might collapse quantum superposition to affect or even create material reality.

For the *Metaphase Typewriter revival project*, I collaborated with American physicist Nick Herbert and programmer M.U. Shrooms. In 1970, Nick Herbert built a communication device, the "Metaphase Typewriter", to test the ability of consciousness to probe quantum states to produce material outcomes. It comprised a radioactive source, a Geiger counter, a room of computers and a tele-typewriter. A computer program converted the frequency of random intervals of radioactive decay at the quantum level into an output of letters from the tele-typewriter based on their frequency of occurrence in the English language. I read about Herbert's metaphase typewriter in 2011 in David Kaiser's book, *How the Hippies Saved Physics* [17] and subsequently contacted Herbert, seeking his imprimatur to re-create his device as an artwork using contemporary technology.

My device contains a radioactive source (a gas lamp mantle) and a Geiger counter (figure 3) that is connected to a laptop computer via a USB. Reading the radioactive decay (a quantum event) random bits are generated by the Geiger counter. These bits are then converted, via Shrooms' program, into a number range that represents a word in a word list. The list is a modified version of the *Corpus of Contemporary American English* (a word list compiled by Professor Mark Davies at Brigham Young University for which we sought permission to use). [18] The more frequently occurring words have a wider number range. Less frequent words are represented by a smaller number range or by just one number. Shrooms' program allows for the possibility that, as random words are produced, simple sentence structures may form.

The frequency of decay does not strictly equate to the frequency of the word in the word list. The radioactive decay as read by the Geiger counter is simply a random event that produces a random number. It does not reflect the time interval between each decay event. We would need to know the number of particles available and usual/average rate of decay to add this into the program. So, to

affect the output of a single word, consciousness must, in theory at least, interact with the device at each bit generation to effect a specific result.

During my exhibition *No Singular Reality* [19] in April 2012, where the *Metaphase Typewriter revival project* was exhibited, a viewer told me that, after spending time with the device in the gallery, it had “spooked” her “to the core” and she did not want to go near it again. She had perceived a connection with the output of words and her mind that had terrified her.

When this work is exhibited, the outputs are also streamed live to the Internet via the website [www.damon.com/mtrp](http://www.damon.com/mtrp) (where all outputs from the project can still be viewed on that site). One friend in America who interacted with the device over the Internet, reported to me that the words produced by the device had relevance to what he was thinking and intending, and he meditated in a connected state with the device for some time. My own revelatory experience with the *Metaphase Typewriter revival project* was unintentional and unexpected. In April 2012, I worked late into the evening to de-install the exhibition. I left the *Metaphase Typewriter* running while I was taking down other artwork, patching holes in the wall and re-painting. I liked the sound of Eric reading the words and sentences as they arrived in cadmium green on the black screen of the laptop. As the gallery emptied of work, Eric’s voice became more resonant in the space. He kept me company for several hours. Finally, there was nothing left to do but to shut down the program and turn off the computer. I was strangely reluctant, and maudlin. I did not want to end the process, to shut off Eric. I killed the switch. Reflecting later, Eric’s last output that night was oddly reflective of my own thoughts: it was “i, i the death into”. If the interactive elements of my ‘mind works’ projects do work to direct conscious intention and will to affect physical reality, they defy conventional reality.

### **Does the Metaphase Typewriter work?**

If consciousness is an agent in quantum

collapse of pre-material states to material reality, is it possible for a viewer of the *Metaphase Typewriter revival project* to intentionally engage their consciousness in this process? Scientists have nominated specific processes through which our brains and minds might interact with quantum processes to collapse quantum superposition into experienced reality. The least radical of these ideas is that of mathematician Sir Roger Penrose and anaesthetist Stuart Hameroff. [20] Their model proposes to explain how consciousness, as an emergent process, arises from quantum states in the brain and how quantum superposition might be collapsed in the brain. This process, they say, occurs in brain microtubules that remain in superposed states until they self-collapse through a procedure involving quantum gravity. The collapse “creates an instantaneous ‘now’ event. Sequences of such events create a flow of time, and consciousness.” [21] In 2010, a team from the University of Queensland and the University of Sydney claimed to have disproved one of the bases on which the Penrose-Hameroff model was premised but conceded that a revised model might still be plausible. [22] Penrose and Hameroff responded to this and other criticisms but still hold to the general precepts of their model. [23]

The Penrose and Hameroff model (as one of self-collapse depending on quantum gravity processes) does not deal with the issue of volition in superposition collapse. Physicists Evan Harris Walker and Henry Stapp, however, have proposed separate specific methods by which our brains interact with quantum states resulting in chosen material outcomes. In addition, Director or PEAR Laboratory, Robert Jahn, and Lab Manager, Brenda Dunne, propose a model of mind-matter interaction that may be helpful for a viewer interacting with the ‘mind works’ projects. However, all of these models are highly controversial and not readily accepted among physical scientists.

Walker [24] suggests that electron tunnelling, occurring in the brain across synaptic gaps between nerve endings (representing a series of quantum events [25]), is the process that

carries out complex activities that creates our thoughts. [26] Using research on synaptic functioning, Walker took a quantitative approach to identify three separate rates of data processing occurring across these synaptic gaps. The data rate for subconsciousness is one trillion bits per second; for consciousness, one hundred million bits per second; and for intention, the rate is ten thousand bits per second. [27] The final rate of data processing for will or intention in his model serves as a “will channel” for the expression of volition. He proposed that before observation, the state of a quantum system is described as a range of possibilities. In the brain, this range of possibilities arises in the synapses that have the potential to fire. The will channel, in Walker’s view, determines our thoughts and choices. However, much more controversially, Walker says that the will channel is the link between, on the one hand, our consciousness and quantum processes in the brain, and, on the other, the events in the material world external to our minds. Walker asserts: “our mind can affect matter”. [28] The “perfect observer”, he argues, will always get what he or she wants. However, we are not perfect observers because most of us lack “purity of mind” and are unable to distinguish the will channel from all of the other thoughts in our consciousness. [29] The will channel, he asserts, carries much less data than the other channels, and can be drowned out by the “noise” from the conscious channel of the mind. Therefore, there is far less opportunity to manifest intention. [30] However, in his view, it is nevertheless possible.

In a similar vein, Stapp [31] proposes that through quantum processes in the brain occurring around the synaptic cleft separating neurons, we can inject “conscious intentions efficaciously into the physically described world”. [32] Stapp proposes that consciousness in the form of free choices operates outside currently known laws of quantum mechanics or classical physics. However, he proposes a model of how conscious intention of the observer might bridge the causal gap between quantum indeterminacy and material outcome. Ordinarily, he says,

conscious intention of the observer does not dictate the result; usually, “nature” chooses one of the possible outcomes according to statistical rule. [33] While the observer can freely choose the questions to put to nature, an answer is returned subject to classical statistical requirements. In this way, conscious intent gets “washed out by the quantum elements of randomness.” [34] However, according to Stapp, this is not always the case; it is possible for conscious intention to dictate physical outcomes. He proposes a process whereby a rapid sequence of similar intentional acts through mental effort will cause, through the “quantum Zeno effect”, a holding-in-place of a “template for action”. The longer the template survives the more likely it will evolve and defeat other expected statistical probabilities. [35]

If the repetitions are sufficiently rapid then a well-known quantum effect, the quantum Zeno effect, will cause a long string of essential identical [processes]... This rapid sequence of events will, by virtue of the known quantum rules, tend to hold in place the associated template for action, and this will tend to cause the intended action to occur. [36]

Stapp equates the Zeno effect to the “watched pot never boils” idea; that is, that just watching something keeps it from changing. [37] Through this effect, Stapp proposes that the mind can intentionally prevent quantum state changes that occur in the brain by intentionally holding onto desired outcomes and overriding other possibilities. In this way, says Stapp, our willful choices cause specific objective outcomes. [38]

In contrast to Walker’s and Stapp’s propositions that *conscious* intention can affect material reality, Jahn and Dunne raise doubts that physical effects can be produced by direct conscious attention. After two decades of research into anomalous mind/matter interactions, they consider that evidence of conscious intention affecting material output is indeterminate. Instead, they propose that it is the “dynamic”

unconscious mind (also referred to as the subconscious, preconscious, non-conscious or implicit mind) through which anomalous mental influence can be achieved upon otherwise inaccessible material processes. [39] The dynamic unconscious, they say, is to be distinguished from the “procedural” unconscious processes that perform simple physiological and mental tasks. [40] Their research indicates that information exchange between mind and matter was more successful where experimental strategies disengaged the conscious mind but stimulated unconscious connection with the task. [41] In this regard, they propose that the dynamic unconscious may be accessed via a “fuzzy” altered state through methods, such as meditation, dream or trance, “where conceptual boundaries blur, categories fail, space and time evaporate, and uncertainty prevails”. [42]

## Conclusion

I do not know if the *Metaphase Typewriter revival project* actually works to allow the viewer to affect or create the material output. I argue, however, that the *Metaphase Typewriter revival project* and my two other ‘mind works’ projects enable viewers to doubt conventional reality. Primarily, they do this in a direct and immediate way as devices that offer states of quantum superposition with which viewers can interact using only consciousness to, arguably, affect or create material output. A willing engagement with the devices brings to the fore, in the mind of the participant, the idea that consciousness might be able to affect the result. Ultimately, the viewer may fall back on, or never alter, their conviction in conventional reality, but the faculty of the device exists to enable the viewer to doubt conventional reality.

(opposite) Documentation and development associated with The Sixth Shore project: microbial mat material in shallow lake © Perdita Phillips. Used by permission

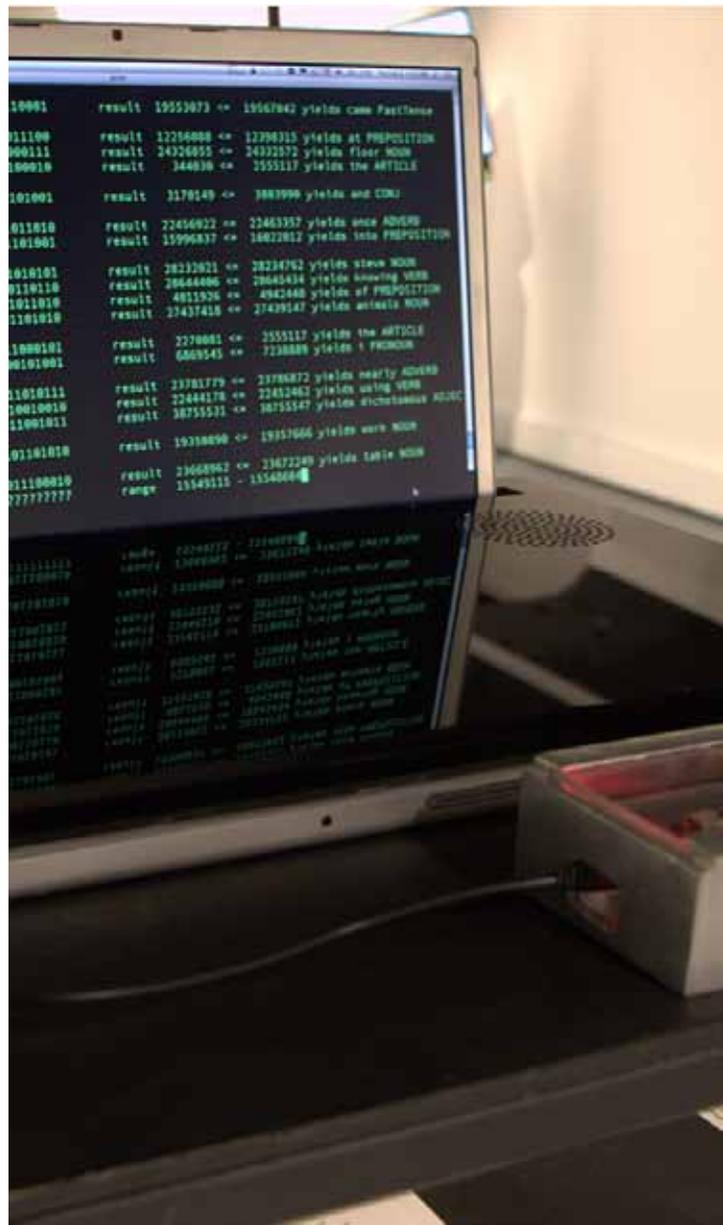


Figure 4. Lynden Stone *Metaphase typewriter revival project* 2012, Geiger counter, gas lamp mantle, laptop, program, Perspex cover, dimensions variable.

