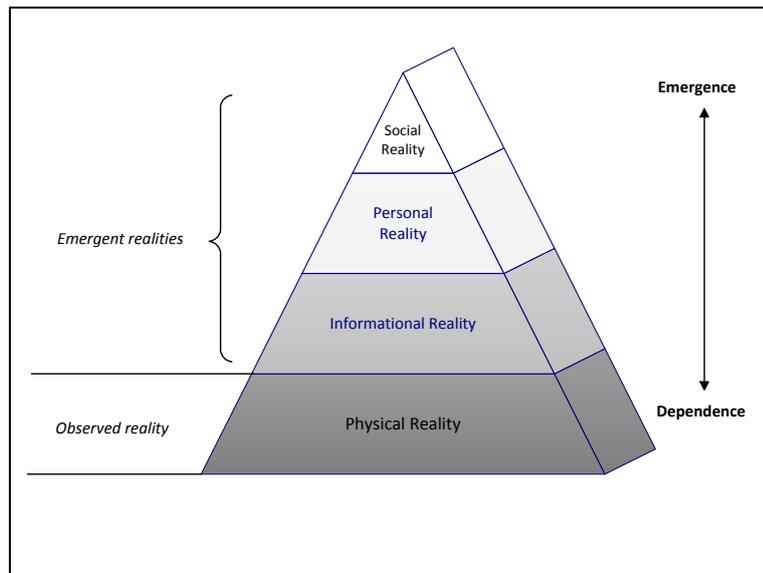# What is reality?

Brian Whitworth, Auckland New Zealand

We see a physical world around us, but disciplines like sociology, psychology and computing study social, human and information systems that they also see as real. The physical world may underlie all science, but all science doesn't describe physical things. Modern computing recognizes requirement *levels* beyond the physical as shown in Figure 1 [1], as each new system emerges from the one below when the observer *sees the world in a new way*, e.g. a line voltage becomes a bit of information when it is seen as a choice. In this way, social structures emerge from a personal meaning [2], meaning emerges from neural data, and data emerges from physical events. In simple *reductionism,* all reality should reduce to physical reality, but then along came a theory of quantum states that perfectly predict physical events and a theory that time and space contract and dilate to keep the speed of light constant. What it all means, if anything, has been disputed for a century, *and the options are*:

Figure 1. Scientific realities emerge from physical reality

1. ***Physical realism***. If the physical world is all there is, then quantum states are just fictions that happen to work, and as Bohr said: *"There is no quantum world"*. This leaves us with a world where one can detect an object without physically touching it [3], a photon can choose its path after it arrives, things can instantly affect each other at any distance [4], and where quantum theory is a "theory of nothing" and light is a "wave of nothing":

   > *"... we accept as nonexistent the medium that moves when waves of quantum mechanics propagate."* [5] p56.

   The argument that *the physics of physicalism* makes no sense is made elsewhere [6].

   Philosophical implications. If everything is physical so are *we,* so our consciousness is an epiphenomenon of neural complexity, and by 2050 more complex robots will take over [7]. The end-state of a purely physical universe is cold, dark and lifeless emptiness, by the second law of thermodynamics[1], giving the nihilism that we are pointless, consciousness is a superfluity and the universe is doomed[2]. Yet if the world *is* a machine so are those who say it, so why listen to them? And if they believe it, to argue it is like arguing that you are a figment of my imagination, futile. By physicalism, all argument and all science, is pointless.

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[1] That the universe is expanding into disorder.
[2] So as in the Queen song Bohemian Rhapsody: *"Nothing really matters – at all."*
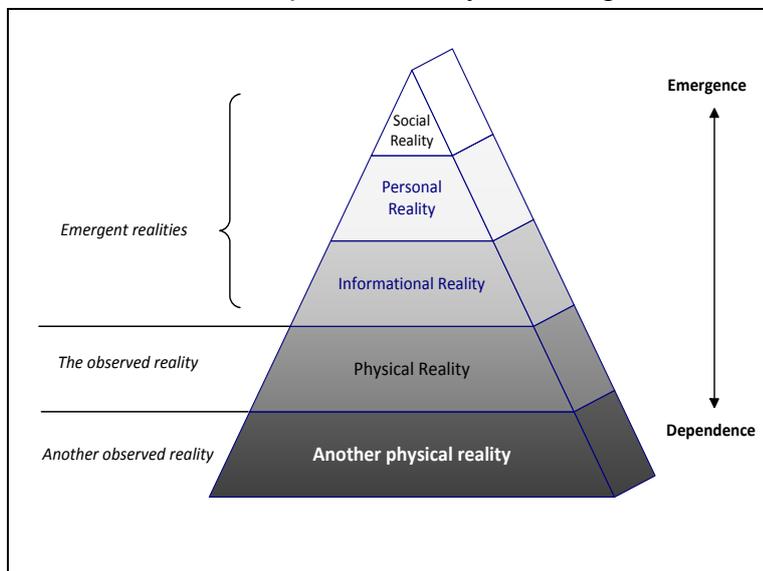
2. ***Dualism.*** In this equally common view, the physical world is *not* everything as the *body* also has a *spirit,* a conscious part made of different stuff entirely. Yet how can two *distinct* realities interact? How can praying to a distant heaven alter the physical laws here on earth?

   Philosophical implications. Dualism allows a heaven or spirit world to explain miracles like healing, but gives a *God of the Gaps,* whose domain is shrinking as science expands.

3. **Virtualism.** Beyond the hopelessness of physical realism and the faith of dualism lies another option that at first seems quite unlikely – that the physical world is a *virtual construct* generated on demand by quantum processing[3]. Framed as the *virtual reality conjecture* it is testable by science, but a virtuality can arise in different ways:

   a. **The Matrix option** *(physical virtualism).* In the movie *The Matrix,* machines in a post-nuclear physical world created a virtual reality just like our physical world from within, and hooked people's minds into it. They wrote the code, set the initial values then ran it on a *really big computer*. The issues facing this view (Figure 2) are:

      i. *Performance*. Physical computers can't do even simple quantum calculations - to handle the quantum processing of even a few molecules:

         "*… would need more memory space that there are atoms in the universe as a whole, and would take more time to complete the task than the current age of the universe.*" (Lloyd, 2006) p53.)"

Figure 2. Physical reality emerges from another physical reality

A finite program can simulate any output by the Church-Turing thesis [8], and quantum theory specifies the output, so a universe of universes *could* generate ours, or our virtual time could be stopped and restarted, so a second of our time *could* take a billion years to process, but it is unlikely.

      ii. *Quantum compatibility*. Quantum states don't act in physical ways, as they:

         "*... appear and disappear in a way that physical states can't, entangled quantum entities ignore the speed of light constraint, quantum entities tunnel past barriers no physical particle can pass ....*" Chap 1, p6.

         If what quantum theory describes is physically impossible, physicality cannot be its base. Physical operations just can't do what quantum states do.

      iii. *Infinite regress*. If the physical world is by its nature virtual, the other physical world generating it would also need another one below it, and so on, giving a "turtles all the way down" problem[4].

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[3] For this argument, see here

[4] In an apocryphal story, a scientist lecturing that the physical universe depended on nothing else was challenged by a little old lady who said it was on the back of a giant turtle. He laughed, and asked her what the turtle was standing on, but got the reply "*Sonny, it's turtles all the way down*". In this analysis, that answer fails.

iv. *Consciousness.* The consciousness of those in the Matrix was from real people in another world plugged into data lines in a "battery farm". So this option just defers the issue of where consciousness comes from to that world.

v. *Explanatory power.* That our physical world is created by another physical world just like it doesn't explain why physicality is as it is in the first place.

Philosophical implications. In this view, our virtual reality is run by another world of machines, aliens or beings from the future (even us). Yet why would advanced beings on a virtual trip visit this world of suffering? Unless it is a reform facility where we get a debrief when we die (the last judgement), then are either sent back (reincarnate), retire to a rest home (heaven) or get penal servitude (hell). As anyone can make up any story they like, the reader can believe as they wish.
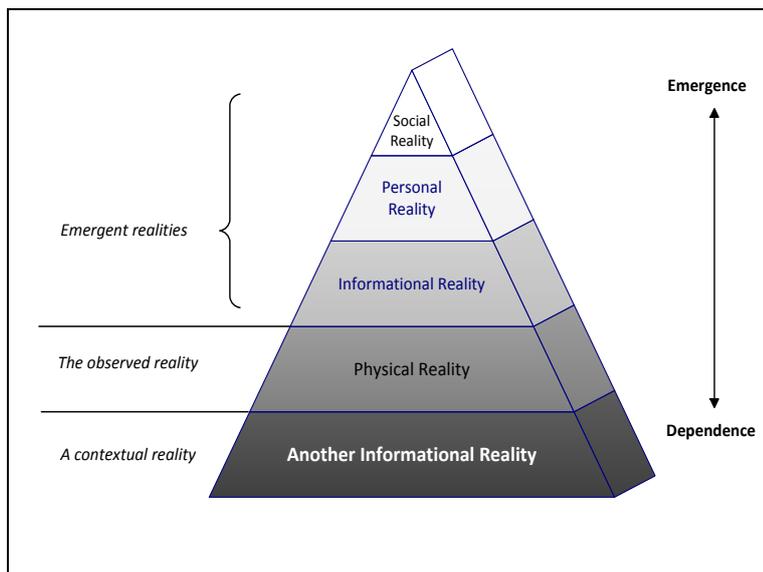
b. ***The simulation option (information virtualism).*** Here a stand-alone program whose base is irrelevant *simulates* the physical world in all its detail (Figure 3). Classical programs can simulate quantum logic gates so in theory quantum collapse, entanglement and superposition *could* be classical processing in another context. The issues now are:

Figure 3. Physical reality emerges from an information reality

i. *Performance.* In theory, the difference between classical and quantum processing is just degree, but even to process one electron whose quantum wave spreads over a galaxy and collapses to a random point is beyond our best super-computers[5]. If a ton of earth came over a wall we couldn't see beyond and our only tool was a teaspoon, we might think that many teaspoons did it, but the more likely answer is a dump-truck. Classical processing with its bit-teaspoon explains quantum mechanics *in theory* but not *in practice*[6].

ii. *Quantum compatibility.* Classical processing is based on the *bit*, a choice of one of two physical states, while quantum processing is based on a *qubit* that can be two physical states at once. Classical processing can *emulate* quantum processing but not *be* it, because it is implemented differently.

iii. *Infinite regress.* Software specified abstractly it is just symbols, like Egyptian hieroglyphics, until implemented. A classical bit only exists relative to a *state not chosen,* so every set of bits has an implementation context [9]. Processing *by definition* changes information that *by definition* implements states, so the bottom of Figure 3 needs a level below it, giving an infinite regress.

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[5] A Milky Way volume of 1.6 x10^{60} cubic meters divided by a Planck volume of 4.2 x10^{-105} cubic meters is about 551 bits, which for a 10^{-43} seconds Planck time is over 5x10^{45}Hertz of processing power for one quantum event. As our best supercomputers are only just breaking the PetaHertz barrier (10^{15}Hertz), to calculate even the simplest quantum processes takes months or even years.

[6] As Yogi Berra said: *"In theory, there is no difference between theory and practice. In practice, there is."*

iv. *Consciousness.* If everything is software, consciousness must arise when it reaches a certain level of complexity, but no evidence at all supports this view.

v. *Explanatory power.* Saying a simulation describes reality if it works but tweaking it when it doesn't isn't science, as the standard model forgot (Chap 4.6.4). That a classical simulation can emulate *some* quantum events is not a testable scientific theory.

Philosophical implications. A simulation implies a designer, who devised the rules, wrote the code, set some parameters "just right" [10] then booted it up at the big bang to run ever since, with perhaps the odd miracle or saint tweak. If all is software the paranormal is possible if we alter the code. I can be uploaded[7] to my own virtual heaven with spouse and kids at my age of 35, or even with the 72 virgins the Hadith writers added to Islam. Yet isn't a virtual heaven also a fake heaven? And if we upload and download minds, isn't a copy of me by definition not me? Isn't a world of code just as mechanical as any physical machine? Did the great coder start it up and walk away for 13.8 billion of our years, like an absentee landlord, or watch it the whole time like the ultimate voyeur? If our world was a *beta release,* do later versions have improved rules like *not* rewarding evil? As anyone can take any view, the reader can believe as they wish.
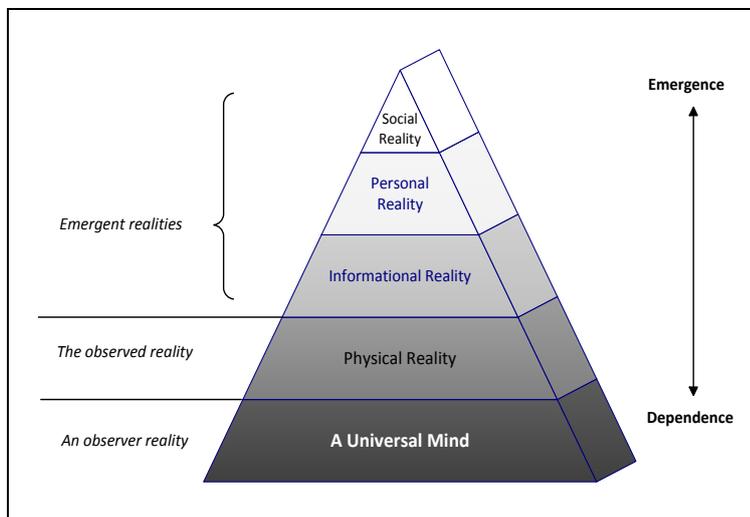

Figure 4. Physical reality emerges from a universal mind

c. ***The universal mind option (mind virtualism).*** Did a *universal mind,* like ours but much bigger, create reality as a multi-person dream[8] (Figure 4)? In psychology, our brain constructs reality and in quantum theory, physical events don't exist until observed, so is a universal mind of mystic traditions like the Vedas feeding us a great dream? Are we just reality data channels on a universal broadcast? The issues now are:

i. *Performance.* A higher mind feeding billions of beings a storyboard of a universe of billions of galaxies interacting for billions of years is a multi-user dream of staggering proportions. How is consistency maintained?

ii. *Quantum compatibility.* If we are dreaming, the universal mind can just say "be" and it is, so why invent quantum states? Or does it *tailor* its detail, inventing dinosaurs when we find fossils and new particles when we build accelerators, like a parent making up a fairy story to a child?

iii. *Consciousness.* If you and I are dreamers what about dogs or insects? To a psychopath *people* are unreal, so is killing an *insect* like that? In our games, avatar pixels represent people but *non-player characters* (NPCs) are empty pixels, not occupied by any being. What in our world is like that? If as Rumi said: "*I was a mineral that became a plant that became an animal that is now*

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[7] See http://en.wikipedia.org/wiki/Mind_uploading
[8] For example, see Harun Yahya's claims.

a man", when in that evolution was consciousness added? Each of us is from a fertilized egg that divided, so unless one-celled amoebae are conscious[9], when did the growing aggregate of cells become conscious?

iv. *Explanatory power*. If we are dreaming, consistency requires a basic rule-set that say includes Newton's laws, but causality doesn't actually occur, as in a simulation, but only *appears* to occur, as in a movie. Yet a made-up rule-set that evolves like a TV series can't be tested, or predict anything new.
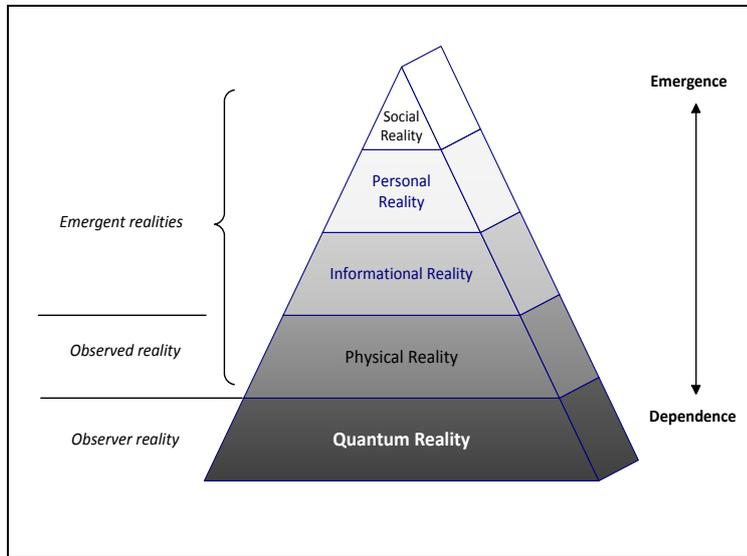
Philosophical implications. A multi-player dream world is still a *fake*. Even if a law of karma feeds our past acts back to us in the future, what we do doesn't really matter. And why would a supreme mind torture itself with the nightmare of our world, of disease, murder and tragedy? If I dreamt up a world, it would be better than this one! That some great being invented a story to fool us all is an unlikely anthropomorphism[10], but again anyone can make up what they want.

Figure 5. Physical reality emerges from quantum reality

d. ***Quantum realism*** *(pure virtualism).* Is that the primordial reality that generates physical reality doesn't derive from the physical in any way (Figure 5), whether physically, from information or from a thinking mind of any sort. In this *cosmic pantheism[11]*, the primal *observer* generating the physical *observed* as a virtual construct in the first event (Figure 6).
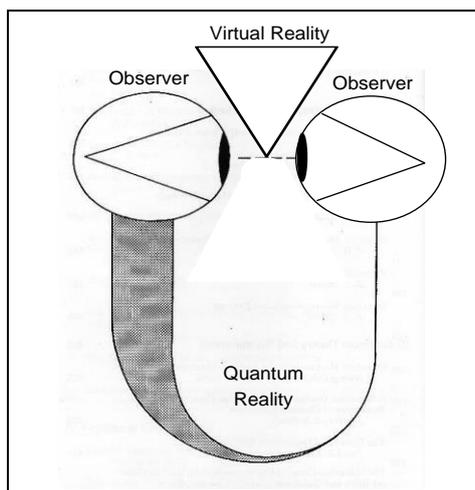

Figure 6. A quantum reality sees itself

The details are given elsewhere (Annex A), but both quantum theory and relativity *require* an observer, as a wave function must be observed to collapse and matter needs an observer frame of reference to move. One reality providing both the observer and the observed is all that is needed for our reality to start. The *interaction* we call physical reality then evolved from light into matter into life into sentient beings like us in an *unbroken sequence of events*, with no external intervention or formal design.

Speculation beyond the observer and the observed, on other worlds, programmers or super minds, is imaginary but *reverse engineering physical reality* is not making things up, as it must give a consistent model. In this case quantum theory describes the particle "applications" and

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[9] If so, does the universal mind get bored, being an ant say?

[10] The *anthropic principle,* that the universe we are in must be compatible with humans, is a truism, but to say that what we see must be objectively real <u>because</u> *we* see it, is an *anthropomorphism*.

[11] Pantheism is used here in the sense outlined by Spinoza in his reply to Descartes dualism.

relativity theory their time and space "operating system". The previous issues are now resolved as follows:

i. *Performance.* A non-physical quantum quintessence isn't subject to physical limits, and quantum (not classical) processing in a client-server link *can* create the information we call the physical world.

ii. *Infinite regress*. A non-physical network has no physical regress, quantum processing has no contextual regress as the qubit of its processing is context free (Ch 2.2.1), and an observing reality has no observer regress.

iii. *Quantum compatibility.* Quantum states as program waves can spread on a network to overload it, and the collapse of the wave function can describe the ensuing reboot, in which quantum entities merge and reallocate processing (Annex A). The equations are the same, but now quantum theory describes what actually occurs, not some mathematical fiction.

iv. *Consciousness*. This model distinguishes the *self-awareness* behind symbolic thought from a conscious *being* that has free choice. If the Western "*I think therefore I am*" becomes the Eastern "*I am therefore I think*", consciousness came before thought. Conway's free will theorem says: *If any part of the universe has free will, it all does, but if any part doesn't, then none of it does* [11] – so either nothing is conscious or everything is. In this view, everything is conscious, there are no empty pixels and every electron is a "player".

v. *Explanatory power*. Reverse engineering physicality begins as a post-facto model, but over time it gives the testable predictions that:

a) <u>Matter evolved from light</u>. This model derives quarks, leptons and all matter from light colliding, which the standard model doesn't allow. It predicts that extreme light colliding will produce matter[12] (Ch4).

b) <u>There is no Higgs</u>. The idea that mass creates mass reinvents the medieval fiction that like creates like. The massive particle CERN found can't be a boson by quantum theory [12], so it is likely a high order meson.

c) <u>The top electro-magnetic frequency is space</u>. If space were nothing it could not "curve", exert pressure or create matter, as it does. A null *particle* is nothing, but space as null *processing* is like a blank screen refreshing at the maximum rate, so it can be the highest electro-magnetic frequency.

This model accepts the standard model's equations, but sees its invisible fields and virtual particles as a post-hoc fantasy on a scale not seen since Ptolemy's epicycles [13].

Philosophical implications

A reverse engineered model has fewer options for speculation than usual, as it has:

i. *No elsewhere.* There is no "other" place for the program, programmer or data of a simulation to reside. There is no uploading as there is nowhere to upload to. The "other" world of dualism is here now, and if this quantum flux stopped, mountains, seas and sky would vanish instantly, like a movie that is ended. In physical realism there is no other world except what we see, but in virtual realism what we see isn't real, and so only the "other" world is real.

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[12] In current theory, photons, being bosons, cannot collide. In this model, photons, being processing, can in the extreme case collide, to create matter that appears to be static because it is a recurring program reboot.

    ii. *No conditions*. Is our universe just right for life by chance or did a benign creator make it so [10]? In this model, in the first event a node of a linked quintessence "broke" to create *the first photon in the first space*. The ensuing chain reaction (inflation) then gave all the free energy of our universe, until the expansion of space healed the rip. Everything in our universe began from one photon in one volume of space, not the singularity proposed[15]. There was no pre-set design but

Table 1. A comparison of reality views

Question	Traditional Views		Virtualism			
	Physical Realism	Dualism	Matrix Option	Simulation Option	Universal Mind	Quantum Realism
Does the physical world self-exist?	Yes	Yes	No	No	No	No
Are there two self-existing realities?	No	Yes	No	No	No	No
Does classical bit processing generate physical events?	No	No	Yes	Yes	No	No
Do quantum waves spread and collapse as in quantum theory?	No	No	No	Yes	No	Yes
Is there a world apart from our experience?	No	Yes	Yes	Yes	Yes	No[13]
Does consciousness "emerge" from the not conscious?	Yes	No	No	Yes	No	No
Can non-physical causes occur?	No	Yes	Yes	Yes	Yes	Yes[14]
Can this view predict new physical facts?	Yes	No	No	Yes	No	Yes

neither was it an accident, as a repeat would give the same laws of physics.

    iii. *No control*. Like an orchestra with no conductor, each node in this network does its own thing. Von Neumann computers have a central processing unit (CPU) to keep time and direct events, but this system, like the Internet, the human brain and democracy, is *decentralized* [14].

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[13] Physical realism assumes the observed is all there is. Dualism imagines another reality beyond our experience. Quantum realism takes the observer interacting with the observed, which is our experience, as all there is.

[14] In physical realism, *every physical event has a physical cause*. Dualism is the same, but also allows divine causes. The matrix, simulation and mind options of virtualism have rules to maintain physical causality but also permit external interventions. In quantum realism, every physical event is a free choice from innumerable quantum states, so *every physical event has a non-physical cause*.

[15] If the entire universe began at a point singularity, it should have immediately collapsed into a black hole.

iv. *No errors.* If I choose one option over another and it fails it is an error, but if an *evolution* takes both options so if one fails and one succeeds it is not an error, and if both fail nothing else was possible. The evolution of matter preceded that of life, as matter began in the first maelstrom and higher elements arose in the hearts of stars and supernova. Dawkins sees us as an "*improbability on a colossal scale*", but if *evolution is the design*, self-awareness is inevitable.

Conclusions

Table 1 compares the various theories on key reality questions. In physical realism the physical world is as it seems, self-contained and self-sufficient, and orthodox science is its voice. Dualism agrees, but affirms a reality beyond the physical machine, and orthodox religion is its voice. In quantum realism the physical world *mediates* reality, but this argument is uncommon[16].

In quantum realism there is a real world out there, but we only see a construct, an *interface to reality,* just as an email is an interface to a person. In the Matrix option, reality is a bigger physical world, in the simulation option it is a big program, and the mind option a great mind, but this model has no physical states, bit states or mental states. The physical world is a construct, as in the Matrix, but what creates it isn't physical but something else. As in the simulation option, physical events are output, but quantum processing gives quantum states not physical states – so something else must *choose* the physical state. As in the mind option, an original reality did divide, but into photons not us, which then evolved into matter, plants, animals and us. If consciousness always was, no lines have to be drawn on the seamless progression of evolution.

In quantum realism, the observer is real not the observed, so physical events only occur if observed, as quantum theory says. This view has no voyeur watching from on high, but everything is observing everything else, so nothing is hidden. No record of deeds is kept, as there is nowhere to store it, but there is no need, as the physical world *is* the system database. This is no fake reality if it is the *only way* an observer can observe at all. In this model, empty space and a black hole are the same *quantum* processing ongoing, but the *physical* result is a free choice in the here and now. This system can't be saved, uploaded or rerun, because:

> "*The moving finger writes, and having writ moves on, nor all thy piety nor wit can lure it back to cancel half a line.*"

The two great movements of humanity, religion and science, address the great questions, "*Who am I?*" and "*What is reality?*" The first studies the inner world of consciousness and the second the outer world of things. If what is observed is also observing, with physicality their interaction, *they are the same question.* Orthodox science and religion conflict because they look in different directions, in and out, but why must knowing the world deny knowing the self? Let both be valid approaches to reality. If the observer and the quantum world are of the same nature, instead of being inside a physical world looking out, we are outside a virtual world looking in.

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[16] For example, Christian Gnostics held that the original *fullness* (Pistis Sophia) birthed a monstrous *demiurge* (lesser god) who created our false physical world, Hindus believe that the world is Brahma's "play", etc.

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Annex A: Reverse Engineering Reality

In this ongoing project, the following chapters are mostly done:

1. The physical world as a virtual reality. The evidence, logic and method of the project.
2. Simulating space and time Space and time expressed in processing terms.
3. The light of existence. A photon as a Planck program spreading by instantiation.
4. The matter glitch. How light evolved into matter.

The following are in progress:

5. Bit-shifting space (gravity and how matter moves)
6. The ego illusion (the psychology of the "self")
7. Who am I and what is real? (the philosophy of quantum theory)

Any comments, critical or not, are welcome. Any ideas to support this project are also welcome.