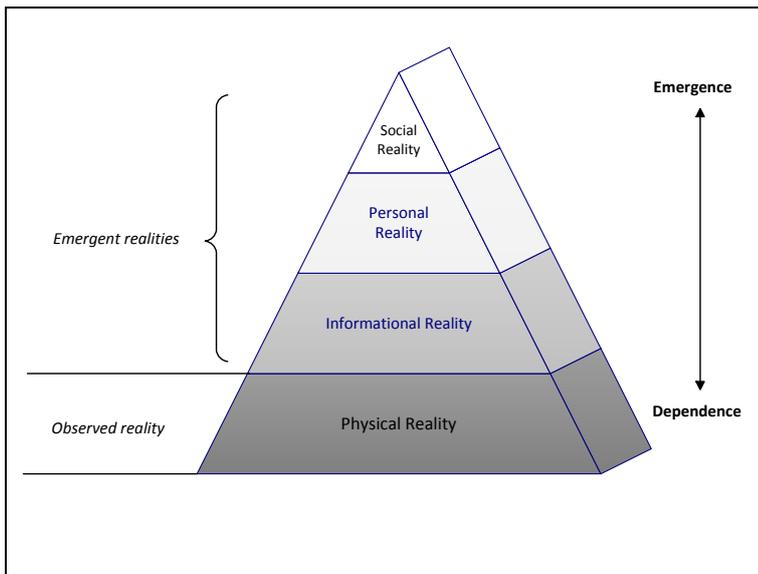# What is reality?

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Introduction

Physics studies physical events, but disciplines like computer science, psychology and sociology study information, psychological and social systems whose elements are not physical

Figure 1. Scientific realities emerge from physical reality

at all. This clarifies why computing is not just about hardware but also software, people and society as well (Whitworth & Ahmad, 2014). Higher *levels* of reality *emerge* when we see the physical world in a new way (Figure 1), so a physical *voltage* becomes an information *bit* when *seen as* a choice, and in the same way human meaning emerges from neural information and social structures emerge from human meaning (Bone, 2005). We assume that the physical level is the end of the reality line, but physics today is more about ghostly quantum states, hidden dimensions and imaginary particles than physical things (Baggot, 2013). In addition, a physical world that itself *began* about 14 billion years ago cannot be a first cause, raising the possibility that the physical level emerges from something else, i.e. *is virtual*. That this *virtual reality conjecture* is a testable theory compatible with physics is put elsewhere (Whitworth, 2010b) - this paper just reviews the reality alternatives.

The main options

Historically humanity has taken three approaches to reality:

1. **Physical realism**. Is the *monism* there is only one reality and the physical world is it, so:

> *"There is nothing outside the physical universe"* (Smolin, 2001).

If as Bohr said: "*There is no quantum world"*, quantum states are just fictions that happen to work, and quantum theory is a *theory of nothing* just as light is a *wave of nothing*:

> "*... we accept as nonexistent the medium that moves when waves of quantum mechanics propagate*." (Laughlin, 2005) p56.

So when experiments show that we can detect an object without physically touching it (Kwiat, Weinfurter, Herzog, Zeilinger, & Kasevich, 1995), that a photon chooses its path after it arrives, and that entities can instantly affect each other at any distance (Aspect, Grangier, & Roger, 1982), that is nothing less than miraculous.

Philosophical implications. If everything is physical, the *end-state* of the universe is a cold, dark and lifeless emptiness by the second law of thermodynamics. In this depressing *scientific nihilism,* we are biological machines with a delusion of free choice floating in a doomed universe so *nothing really matters*. Yet if so, why bother with science at all?

2. ***Dualism.*** In *dualism* the physical *body* is still real but it adds the hope of a non-physical *mind* or *spirit*. Descartes dualism let the new science coexist with religion, but today it divides scientists into *atheists* who believe only in the physical world, *theists* who also believe in a world beyond and *agnostics* who don't know. Attributing every unknown thing to a higher realm gives a *God of the Gaps,* whose domain shrinks as science expands.

   Philosophical implications. Dualism faces the problem of *different realities interacting*. If spirit and body realms don't interact then each is irrelevant to the other. If the spirit sees the body but can't affect it, what use is it? If spirit and body conjointly affect results, which one is primary? A spirit that *emerges* from the physical brain is just a byproduct, like steam rising from hot soup, while a spirit that *controls* the brain and body could cure cancer. If heaven and earth are at war, why hasn't heaven purged earth already, or earth corrupted heaven? If they are two sides of the same coin, what is the coin?

3. **Virtualism.** In this view, the physical world is generated on demand, as in game where when we look left a left view appears and when we look right a right view appears, so:

   Nothing in the physical world exists objectively, i.e. of or by itself.

   This doesn't deny science, for if some Sims characters started to think, they could test theories as we do by information from their world. If they found a world of pixels where time bends and space curves, that began at a past instant, as we have, they could deduce that it was virtual. The equivalent argument for us is given elsewhere (Listverse, 2014).

The virtualism options

The physical world as a *construct* can be interpreted as follows:

1. **Physical virtualism** *(The Matrix option).* Is that the physical world arises from another physical reality (Figure 2). In the movie *The Matrix,* AI machines in a post-nuclear world kept people in vats and fed their brains data about a city they thought was real, which is possible because we only "see" nerve information anyway. The issues facing this view are:
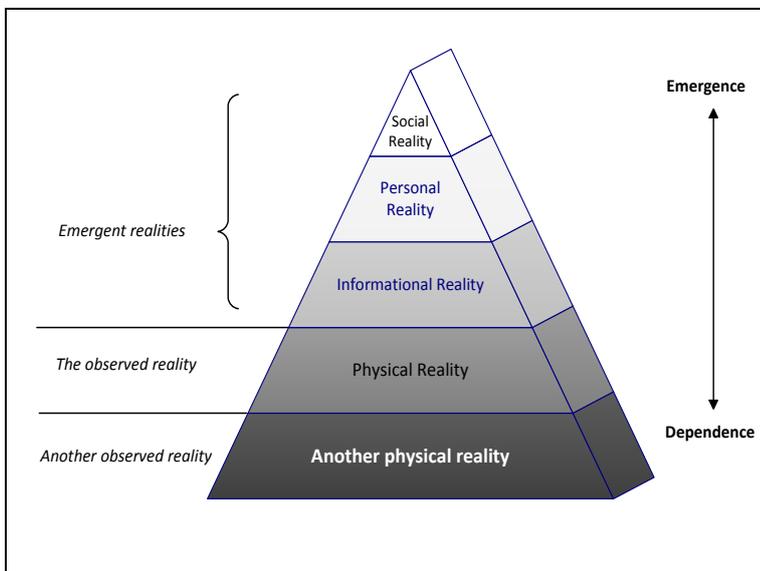

Figure 2. Physical reality emerges from another physical reality

   a. *Performance*. To calculate the quantum activity 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.)"

   b. *Quantum compatibility.* Quantum states come and go in a way that physical states can't, interact faster than the speed of light, and tunnel past barriers no particle can pass. What quantum theory describes is physically impossible so how can physicality be its base?

   c. *Regression.* If another physical world is generating ours, it could also be virtual since processing *stacks,* giving a likely regression (Bostrom, 2002).

d. *Consciousness.* The consciousness of Matrix inhabitants came from people in another world, which defers the question of consciousness to a physical world we can't see.

e. *Testability.* To explain quantum theory in physical terms requires *many worlds theory* (Everett, 1957), that every quantum choice creates another universe, giving a *multiverse* machine that makes no choices. This untestable theory was first thought absurd, as it is, but physicists today prefer it 3:1 over other theories (Tegmark & Wheeler, 2001) p6. The *clockwork multiverse* is the zombie theory[1] reincarnation of the *clockwork universe* fairytale that quantum theory demolished the century before.

Philosophical implications. If our world is a virtual reality made by machines, aliens or ourselves from the future, why did they bother? Nuclear plants give more energy for less trouble than people in vats. Or if it is training with a debrief (judgement), followed by a reward (heaven), a retry (reincarnation) or penal servitude (hell), what is the training for?

2. **Information virtualism** *(simulation option).* In this view the physical universe is the output of a *cosmic program* (Figure 3), as Wheeler's "It from Bit" implies. The issues are:

a. *Performance.* Classical programs can simulate quantum logic gates so *could* cause quantum collapse, yet to compute the quantum collapse of one electron whose quantum wave has spread over a galaxy is beyond all the computers on earth today[2].

b. *Quantum compatibility.* A classical *bit* is a choice between two physical states while a *qubit* includes a both states at once option, so classical processing can *emulate* quantum processing but can't *be* it, as it works differently.

Figure 3. Physical reality emerges from an information reality

c. *Regression.* A classical bit *by definition* is a physical state relative to a *state not chosen,* and so must have a physical context (McCabe, 2005). That Figure 3 has a physical level below it allows an on-going regression.

d. *Consciousness.* In multi-player games, characters not occupied by people are *non-player characters* (NPCs). If life is a multi-player game which residents are NPCs, i.e. *empty pixels*? If people are *players,* what about dogs, plants or rocks? Inorganic material evolved into the first cell, plants, animals and us in an unbroken chain, and a single egg cell divided into every person, so when was consciousness added? Is everything just pixels, or did someone have to play a rock for a million years?

e. *Testability.* Science doesn't test theories by cherry-picking cases (Wolfram, 2002). A world simulation must explain *all* basic physics, including space, time, light, energy, matter, spin and charge.

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[1] A zombie theory can't be killed because it isn't scientifically "alive", i.e. doesn't predict

[2] A Milky Way volume of 1.6×10^{60} cubic meters divided by a Planck volume of 4.2×10^{-105} cubic meters is about 551 bits, which for a 10^{-43} seconds Planck time is over 5×10^{45} Hertz of processing power for one quantum event. Our best supercomputers are only just breaking the PetaHertz barrier (10^{15} Hertz).

Philosophical implications. If reality is a multi-user operating system was ours a *beta release,* e.g. do later versions *not reward evil*? A simulation implies a coder to write the program, set some parameters *just right* (Davies, 2006)*,* then boot it up at the big bang. Did the Great Coder then sit back and watch creation unfold, like the ultimate voyeur, or leave to do other work, like an absentee parent for 14 billion years? As even a good simulation is still fake, is it an experiment, or worse, an amusement?

3. **Mind virtualism** *(universal mind option).* In this view a *universal mind* is having a multi-hallucination or feeding many user dreams (Figure 4). The issues are:
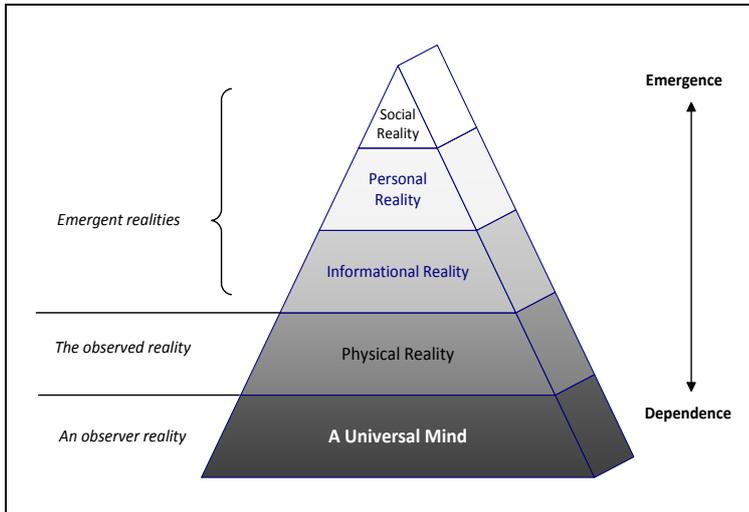

Figure 4. Physical reality emerges from a universal mind

a. *Performance.* A great mind having *many-dreams* is a multi-thought of unbelievable proportions. Or if I am dreaming why is *my dream* so boring?

b. *Quantum compatibility.* If the universal mind can say be and it is, why the complexity of quantum states? Dreamers don't need this detail.

c. *Regression.* A mind that thinks needs a brain to process information which implies physical states. If we are like the TV receivers of a universal broadcast, where is the transmitting station? A mind with a physical level is again a regression.

d. *Consciousness.* If we are all part of one mind, why is it talking to itself?

e. *Testability*. If we are dreaming, anything is possible so there is no way to test that.

Philosophical implications. Why would a great mind dream the nightmare lives of murderers and drug-addicts? If we are dreaming there is no real world out there, but that a cosmic director is *tailoring* a dream to trick us is an unlikely anthropomorphism[3].

4. **Pure virtualism** *(quantum realism).* In this view there is no multi-verse, cosmic program or universal mind, just a quantum reality creating a physical *on-demand interface*. There is indeed one reality but the physical world isn't it. This is no game, simulation or dream because there is still a real world out there – it just isn't the one we see. What we see merely *mediates* the real (quantum) world. Now quantum events predict physical events because they cause them and physical events are indeed generated when we look, just as quantum theory says. If the physical world is just another *view*, physics becomes just another reality interpretation, no different from the other sciences (Figure 5). The logic is that every physical observation requires an observer and observed, so either:

a. *The observed (matter) is real,* and creates the observer, or

b. *The observer is real,* and the observed is the derivative.

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[3] 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 the *anthropomorphic fallacy.*
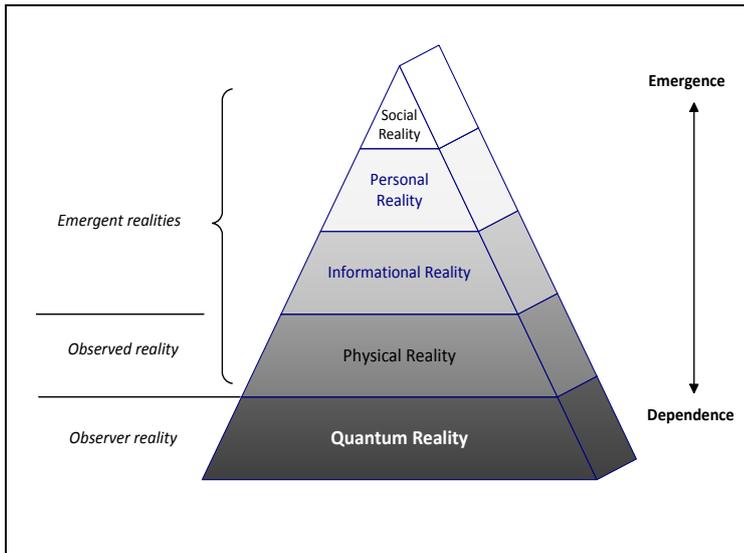
Figure 5. Physical reality emerges from quantum reality

Physical realism assumes the first, dualism tries to make both true, and quantum realism takes the option that the observer is real. Some think this choice is solipsism, that life is a dream, but if *everything is observing everything else* the Hindu *Tat Tvam Asi* (Thou Art That) applies, so "Thou" and "That" can have the same source. In information terms, the quantum world can be both "sink" (observer) and "source" (actor), with physical events the information exchange between them (Figure 6). This resolves the prior issues as follows:

a.   *Performance.* A quantum computer as big as our universe could create the physical universe as a virtual reality on demand (when observed).

b.   *Quantum compatibility.* If a quantum wave is a *program* spreading on a *network*, quantum collapse can be a *node overload* that causes the program to *reboot* and restart the distributed processing at that point, just as quantum theory says. This explains the same equations, but now they describe actual events not some mathematical fiction.
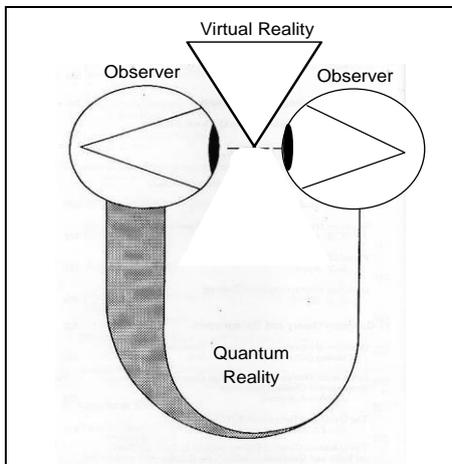

Figure 6. Quantum reality sees itself

c.   *Regression.* Quantum processing is context free a qubit includes state combinations. A quantum reality that exists without anything physical implies no regression.

d.   *Consciousness.* Conway's free will theorem states: *If any part of the universe has free will it all does, but if any part doesn't then none of it does* (Conway & Koch, 2006). So if an electron is mechanical we are too, or if we are conscious so is an electron. These are the only options so in quantum realism *everything is conscious* even an electron. A virtual reality requires an observer to exist before it starts, so in this theory consciousness had to exist before the first event. We have evolved thoughts like "I"[4], but to think thought is *being* or consciousness is an error, e.g. if we are conscious then are babies? If babies are conscious then are dogs? If dogs are conscious then are birds? If birds are conscious then are lizards, or fish, and so the argument goes on to plants and bacteria, until one must draw an arbitrary line or say that rocks are conscious. Quantum realism draws no lines on evolution. In this *cosmic pantheism*[5] the entire universe is "alive" in the sense of being able to freely choose and observe. Only the physical world, being fixed one way, is "dead".

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[4] The *ego,* as our *idea* of ourselves, is entirely imaginary. Our actual self, or consciousness, is not an idea.

[5] Pantheism is used in the sense of Spinoza's reply to Descartes dualism.

e. *Testability. Reverse engineering the physical world* can explain our space and time (Whitworth, 2010a), how light behaves (Whitworth, 2014) and suggest a processing alternative to the standard model (Whitworth, 2015). It gives the testable prediction that *extreme light will collide to create matter,* denying the standard model rule that bosons can't collide (Whitworth, 2015). When physicists stop colliding matter and start colliding light, this theory will be tested.

Philosophical implications

This theory has:

i. *No heaven.* There is no "elsewhere" for players, programs or minds to exist, except the *ever-present here and the eternal now*.

ii. *No big bang or singularity.* A physical universe that began as a singularity would immediately form a black hole, and no "bang" explains how space itself expands. In this model, the *first event* was a rip in the original quantum fabric that gave *one photon* in *one volume* of space, and everything came from that.

iii. *No control.* Like an orchestra with no conductor, or the Internet, each quantum node freely does its own thing, with no-one in charge. Everything has choice.

iv. *No errors.* To choose an option that fails is an error, but a quantum wave takes *all* possible paths to a physical event, so quantum evolution makes no mistakes.

Quantum entities tunnel, entangle and superpose in weird ways but when *observed* the weirdness becomes a physical event. How does *observing* turn quantum reality into physical reality? If the physical world is an image created by a program, it must be so. As a click brings up a new screen so *querying* reality gives a physical event, and just as the rules of the program are not those of the screen so quantum theory ignores physical laws. Quantum theory is the rules of the quantum reality that physical reality derives from.

Quantum realism

Table 1 shows how quantum realism differs from previous theories on key issues. In physical realism every physical event has a *physical cause* and orthodox science is its voice. Dualism agrees but adds *divine causes* and orthodox religion is its voice. In quantum realism every physical event has a *non-physical cause* (quantum collapse) and an esoteric minority have always held that the physical world isn't real in itself[6]. This view has no watcher on high but everything is observing everything else so nothing is hidden. It has no record of deeds in a heavenly book but the physical world *is* the system database so nothing is lost. Two great human endeavours, religion and science, ask the great questions "*Who am I?*" of the inner world (Maharshi, 2004) and "*What is reality?*" of the outer world. If the same reality underlies the seer and seen, *they are the same question,* and consciousness could be the backdoor to what the front door of quantum theory is telling us - that *reality is quantum.*

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[6] In Gnosticism the original *fullness* (Pistis Sophia) birthed a monstrous *demiurge* (lesser god) who spawned our false physical world, in the Vedas the world is Maya or the illusion of Brahma, in Buddhism it is a mirage of the mind, in Taoism it is a false appearance and in Sufism "There is no reality but God", who isn't physical at all.

Table 1. A comparison of reality views

Issue	Orthodox views		Virtualism options			
	Physical Realism	*Dualism*	*Matrix Option*	*Simulation Option*	*Universal Mind*	*Quantum Realism*
Is the physical real?	Yes	Yes	No	No	No	No
Is reality dual?	No	Yes	No	No	No	No
Is there a quantum world?	No	No	No	No	No	Yes
Does "Bit" create "It"?	No	No	Yes	Yes	No	No
Is there another reality?	No	Yes	Yes	Yes	Yes	No
Do electrons "observe"?	No	No	No	No	No	Yes
Is physical reality fake?	No	No	Yes	Yes	Yes	No
Is the theory testable?	Yes	No	No	Yes	No	Yes

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