

# Quantum Realism

## Chapter IV. The Matter Glitch: An alternative to the standard model<sup>1</sup>

*“Scientists who don’t question their theories are priests”*

Brian Whitworth, Auckland, New Zealand

### 4.1. INTRODUCTION

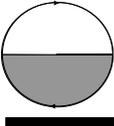
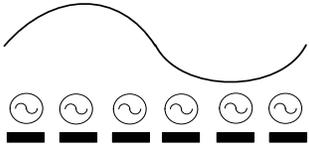
*This is the fourth chapter* on quantum realism<sup>2</sup>, the theory that the physical world is the digital output of a non-physical quantum grid (Wilczek, 2008). It is that Wheeler’s “*It from Bit*”, that matter comes from information, is literally true.

*The first chapter* argued that quantum realism wasn’t unscientific because that the physical world is a virtual reality is a statement about *this world* that science can test<sup>3</sup>, and that relativity and quantum theory now make it the simpler theory<sup>4</sup>.

*The second chapter* gave the model’s foundations, of space as a network processing time cycles, or as Hiley says:

*“I remember ... Richard Feynman ... saying that he thought of a point in space-time as being like a computer with an input and output connecting neighboring points”* (Davies & Brown, 1999) p138

The network proposed connects in four-dimensions not three, making our 3D space a *surface*, like a two dimensional screen for us. As Davies says:

Space	Light	Matter
		
<i>Planck program in one node</i>	<i>Planck program in many nodes</i>	<i>What is matter?</i>

“... the shape of space resembles a three-dimensional version of the surface of a sphere, which is called a hypersphere.” (Davies, 2006) p45

Space as a hyper-sphere surface has no center or boundary and can expand everywhere at once just as our space does.

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Figure 4.1. If a photon is space stretched out, what is matter?

*The third chapter* defined every photon as the distribution, more or less, of a basic *Planck program*, whose displacements in one node cancel to be space but over many nodes give the sine wave of light.

*This chapter* now considers how matter arises (Figure 4.1) and suggests an alternative to the standard model.

### 4.2. THE STANDARD MODEL

The standard model of physics took over a century to build and summarizes:

<sup>1</sup> For the latest see [here](#), or for the most recent chapter versions see: [Chapter1](#), [Chapter2](#), [Chapter3](#) and [Chapter4](#).

<sup>2</sup> *Quantum realism* isn’t *physical realism* (that only the physical exists), or *solipsism* (that all is a mind illusion), or *dualism* (that there is a spiritual realm beyond the physical). It is that the quantum states we don’t see generate the physical states we do see.

<sup>3</sup> The *scientific method* puts a thesis about the world, defines its anti-thesis, then picks the best based on feedback from the world. If the thesis is that the physical world is a processing output, and the anti-thesis that it is an objective reality with nothing outside itself, the question is then simply which theory better describes the physical world?

<sup>4</sup> If the physical world is a virtual reality, the big bang was the system boot up, the speed of light reflects the screen refresh rate, the Planck length is the network density, Planck time is its cycle rate, quantum randomness is processor generated, empty space is null processing, entanglement is programs merging and quantum collapse when a program entity restarts.

“... in a remarkably compact form, almost everything we know about the fundamental laws of physics.” (Wilczek, 2008) (p164)

It is currently considered by physicists to be:

“...truly the crowning scientific accomplishment of the twentieth century.” (Oerter, 2006) p75.

It sees all reality as *particles* that divide into light-like *bosons* that don't collide and matter-like *fermions* that do (Table 4.1). The forces of physics then attribute to *bosons*, while fermionic matter splits into *leptons* (electrons and

Table 4.1. The standard model of particles

PARTICLES	FERMIONS (Matter)				Anti-Matter
	Leptons		Quarks		
	Electron like	Neutrino like	Up-like	Down-like	
<b>Generation 1</b>	Electron (e)	Neutrino (ν)	Up quark (u)	Down quark (d)	Same mass, opposite charge
Mass (Charge)	0.511 (-1)	$< 3 \times 10^{-6}$ (0)	1.5 - 4.5 (+2/3)	5 - 8.5  (-1/3)	
<b>Generation 2</b>	Muon (μ)	Muon neutrino (ν <sub>μ</sub> )	Charm (c)	Strange (s)	As above
Mass (Charge)	105.7 (-1)	$< 0.19$ (0)	1,000 - 1,400 (+2/3)	80-155 (-1/3)	
<b>Generation 3</b>	Tau (τ)	Tau neutrino (ν <sub>τ</sub> )	Top (t)	Bottom (b)	As above
Mass (Charge)	1,777 (-1)	$< 18$ (0)	174,000 (+2/3)	4,000 - 4,500 (-1/3)	
	BOSONS (Forces)				
<b>Field:</b>	Electromagnetic	Strong	Weak	Gravity	Higgs
Name	Photon (γ)	Gluon (g)	W <sup>+</sup> , W <sup>-</sup> , W <sup>0</sup>	Graviton	The Higgs
Mass (GeV)	(0)	(0)	(80.4; 80.4; 91.2)	(?)	(125)
Charge	-1 to +1	Eight colors	Isospin (+1/2, -1/2)	?	?

neutrinos) and *quarks* (up and down), where quarks combine into the protons and neutrons of atomic nuclei that electrons orbit around. Apart from neutrinos that seem to whizz around for no reason, and anti-matter that has no reason to be, it all seems fairly tidy, but as Woit notes:

“By 1973, physicists had in place what was to become a fantastically successful theory ... that was soon to acquire the name of the ‘standard model’. Since that time, the overwhelming triumph of the standard model has been matched by a similarly overwhelming failure to find any way to make further progress on fundamental questions.” (Woit, 2007) p1

The fundamental questions the standard model doesn't answer include:

- a. Why don't protons decay as neutrons do?
- b. Why is the universe made of matter and not anti-matter?
- c. Why do neutrinos have a tiny but variable mass?
  - a. Why are there three particle “generations” then no more?
  - b. Why do electrons "half spin"?
  - c. Why does mass vary enormously but charge doesn't?
  - d. Why do neutrinos always have left-handed spin?
  - e. Why do quarks have one-third charges?
  - f. Why does anti-matter have negative spin?
  - g. Why does the force binding quarks *increase* as they move apart?
  - h. What is the dark matter and dark energy that constitute most of the universe?

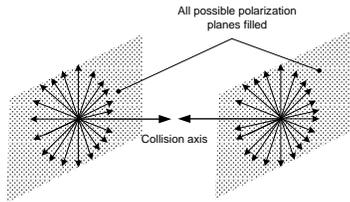
The standard model can't answer these questions, and it probably never will because its two best hopes, string theory and super-symmetry, have led nowhere. This chapter answers the above questions based on programs not particles.

### 4.3. ELECTRONS AND NEUTRINOS

The most likely candidates for the first matter are electrons and neutrinos.

#### 4.3.1. Electrons

In the last chapter, a Planck program running in one node was space and the same program spread over many nodes was light, where:



1. One photon enters a node by one channel<sup>5</sup>,
2. The bandwidth of one channel is one Planck program.
3. Nodes transmit photon streams in lockstep order, so they can't overtake,
4. If two photons meet head-on in one channel, it must process both,

Figure 4.2. Extreme light rays collide

Two ordinary photons meeting in a channel won't overload it because their sum is less than its bandwidth, but two *extreme photons* are different. An extreme photon is a Planck program spread over two nodes, i.e. the smallest possible wavelength and the highest possible frequency of the electro-magnetic spectrum, according to this model. So if extreme photons meet head-on, each requesting half a Planck program, the channel overloads, i.e. they "collide".

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Yet two extreme photons can, by their spin, restart in another axis channel and so disentangle, but what if extreme photons collide in every channel of an axis, i.e. if *extreme light beams*<sup>6</sup> meet (Figure 4.2)? This must have occurred in the initial plasma by Feynman's law of all action (3.4.2), and if *every* channel overloads, the processing has nowhere else to go. If extreme light beams meet, all the channels of one node axis overload and reboot at once.

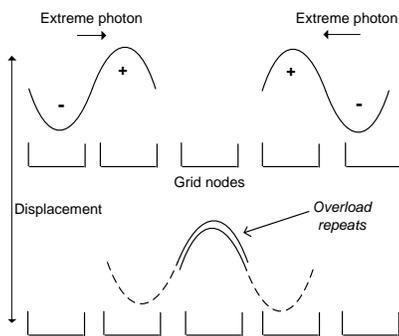


Figure 4.3. An electron channel reboot

Figure 4.3 shows the details for one channel, with every other channel the same. Two two photon "heads", each needing half a Planck program, meet in a channel and overload it. It then reboots and restarts both photon programs next cycle. The *pass-it-on protocol*, to first pass processing on then process what comes in (2.5.4), usually stops an overload repeating, but in this case that fail-safe just gives another reboot, as now the photon tails overload. The result is an infinite reboot, so the grid that once hosted only waves now has a permanent processing bump - *an electron*. It remains because anything hitting *on that axis*

will find all the channels taken, while anything at right angles passes right through its photons.



Figure 4.4. A standing wave on water (from <http://ray.tomes.biz/cymatics.htm>)

In this view, an electron is an electro-magnetic *standing wave* i.e. a wave collision giving a stationary effect (Figure 4.4). In his PhD, Feynman partitioned the electron wave equation into opposing advanced and retarded waves, but he didn't pursue it perhaps thinking that an electron *particle* can't be made of *waves*. Since then, Wolff has argued that electrons are in and out spherical waves (Wolff, M., 2001)<sup>7</sup>, Cramer's transactional theory describes quantum interactions by retarded and advanced waves (Cramer, 1986), and Wheeler-Feynman's absorber theory suggests the same (Wheeler & Feynman, 1945). Experiments show that electro-magnetic waves can repeatedly interact to form static states (Audretsch, 2004, p23), and repeated observations can maintain a quantum state if the time delay is short (Itano, Heinzen, Bollinger, & Wineand, 1990). So electro-magnetic waves can form standing waves, as other waves do.

<sup>5</sup> A channel allows a node to process a photon transverse to its polarization plane, into a quantum dimension.

<sup>6</sup> An extreme light beam is where extreme photons fill every polarization plane on a movement axis, where extreme photons are the maximum frequency of the electromagnetic spectrum (of two Planck lengths).

<sup>7</sup> See [http://quantummatter.com/articles\\_html/body\\_spin.html](http://quantummatter.com/articles_html/body_spin.html).

The standard model sees electrons as fundamental particles, not built of anything else, and photons as bosons that by definition can't collide, but in this model electrons are photon standing waves. Matter is the boundary exception that makes the grid "hang", like a stuck record that repeats. In computing terms, matter is a *system glitch*.

### 4.3.2. The charge remainder

In current physics, electricity is a flow of charge and charge is a flow of electricity<sup>8</sup>. This circular definition, that charge is what charged particles have, essentially means that we don't know what it is. Charge is considered a *self-evident* property, like mass but unrelated.

In this model, what gives mass also gives charge, as if an electron is positive instructions repeatedly rebooting, the negative code that never runs can be charge (Figure 4.3). Keeping account of processing to do is an expected feature of a network keeping its processing books in order, so let charge be any *permanent processing deficit*. A Planck program remainder can be positive or negative, just as charge is, and can cancel out as positive and negative charges do. For an electron that repeatedly reboots, the left-over code will be constant, again as an electron's charge is. A processing model relates mass and charge, with the first being the net *processing done* and the second the net *processing undone*, per cycle.

### 4.3.3. The neutrino byproduct

Electrons are critical to our world, as without them there would be no chemistry and thus no life, but the universe also contains a "little nothing" that until recently we didn't even know existed – the *neutrino*. The sun floods the earth with vast numbers of them each day, but they mostly pass through it like ghosts. The neutrino seems quite pointless, so why did nature make more of them than anything else?

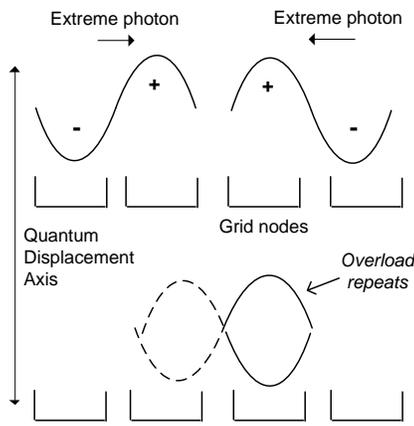


Figure 4.5. A neutrino channel reboot

In this model, the waves that meet to give an electron also give a neutrino for a different phase. Digital waves can meet in two ways: *two heads* can overload one node to give an electron, or a *head and tail* can overload two nodes (Figure 4.5) to cancel into the smudge on space we call a neutrino, i.e. neutrinos are a necessary byproduct of electrons. Note that processing that cancels can still overload a channel and a tail-tail meet isn't possible because it implies a prior head-head state.

The standard model expected neutrinos to have no mass at all, as they have no charge, but their tiny mass was how we detected them in the first place. When asked why neutrinos have a tiny but variable *non-zero* mass while their charge is *exactly zero*, the standard model is perfectly silent.

In Figure 4.5, exactly opposed photons would exactly cancel but the grid, like the Internet, has no central control to synchronize every node cycle. The universal flow of light acts to synchronize adjacent nodes (see 2.5.4) but the effect isn't perfect, so the photons in a neutrino don't exactly cancel. Over many channels this small asynchrony gives a small processing excess that adds up regardless of sign, while the small remainders average out to zero.

To recap, a point in space is a *node* in a network, a photon is a *program* and a node *channel* is what processes it. Just as many planes cut a line, so any axis through a node has many channels, each with a Planck program bandwidth. If the bandwidth of all the channels for one node axis is a *Planck set*, Table 4.2 explains electrons and neutrinos in terms of:

1. *Total processing* regardless of sign, uses up channel bandwidth and if all the channels of an axis are filled with a repeating standing wave, it repels external collisions, giving that axis *stability*.
2. *Net processing*, after cancelling out opposite signs, defines *mass* as the number of processing calls needed.
3. *Net remaining processing* defines *charge* as the processing remainder carried over to the next cycle.

<sup>8</sup> [Wikipedia](#) is not untypical in defining electric charges as those that cause electrical phenomena and electrical phenomena as those caused by electric charges, as does everyone else.

Electrons and neutrinos *survive* as processing entities by permanently denying others access to a grid niche. This *evolution of what is stable* is an alternative to the standard model story of fundamental particles that magically began complete and perfect at a big bang creation. Electrons and neutrinos are brother leptons because they fill the channels of one node axis, even though to us one is something and the other is almost nothing.

#### 4.3.4. Anti-matter

Table 4.2. Lepton processing details

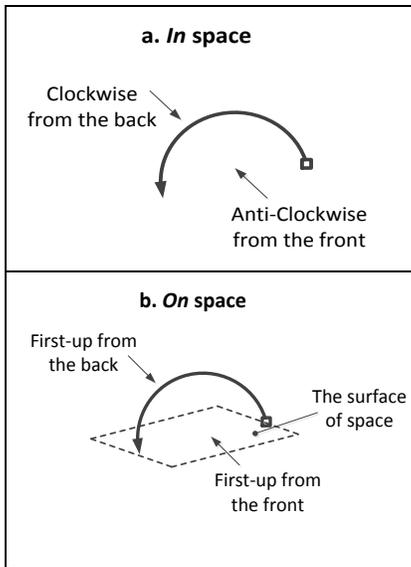
Lepton	Phase	Planck sets
a. Electron	Head enters on axis A left	+1/2
	Head enters on axis A right	vs. +1/2
	<b>Total processing</b> (~stability)	<b>1 (full)</b>
	<b>Net processing</b> (~mass)	<b>+1</b>
	<b>Remainder</b> (charge)	<b>-1</b>
b. Neutrino	Head enters on axis A	+1/2
	Tail leaves on axis A	vs. -1/2
	<b>Total processing</b> (~stability)	<b>1 (full)</b>
	<b>Net processing</b> (~mass)	<b>~ 0</b>
	<b>Remainder</b> (charge)	<b>0</b>

Dirac’s equations predicted anti-matter before it was found but it was never clear, even mathematically, why all matter had “evil twins” of the same mass but reverse charge. The standard model met this challenge by adding an anti-matter column without saying why, but that the matter we see has an inverse is one of the most baffling discoveries of modern physics. Why does nature even allow anti-matter that can instantly annihilate matter? In this model anti-matter is to matter as neutrinos are to electrons – a necessary byproduct.

A photon is a *finite* wave whose leading edge amplitude must be up or down, so the first photon had to vibrate *first-up* or *first-down* on the surface of space, and all the others followed suit. Now a rotation *in* space changes its rotation

direction as it moves, because clockwise from the back is anti-clockwise from the front (Figure 4.6a)<sup>9</sup>, but a rotation *on* a surface that is first up then down stays that way however it moves (Figure 4.6b). So *all* the photons created by inflation, that went on to create matter, process the same way on space.

Any processing that sets a circle of values from a point can by definition set the same values in reverse order by reversing each program instruction, so *processing as defined implies anti-processing*. If an electron is two photon sets setting a circle of values one way, an anti-electron is setting the same values the other way. Reversing the processing of an electron gives an anti-electron, where:



a. *Mass* is the absolute net processing needed, i.e. the program size.  
 b. *Charge* is the positive or negative processing left-over.  
 c. *Spin* is discussed in 4.7.3, on why neutrinos always spin left.

All the basic leptons can now be shown as photon structures (Figure 4.7), where:

1. *Matter* is when *first-up* extreme photons meet, giving an:
  - i. *Electron*: positive heads collide to give mass, and the processing not done gives the negative charge (4.7a).
  - ii. *Neutrino*: positive heads nearly cancel negative tails giving almost no mass, but the remainders cancel out to give zero charge (4.7b).
2. *Anti-matter* is when *first-down* extreme photons meet, giving an:
  - i. *Anti-electron*: negative heads collide to give mass, and the processing not done gives the positive charge (4.7c).
  - ii. *Anti-neutrino*: negative heads nearly cancel positive tails giving almost no mass, but the remainders cancel to no charge (4.7d).

In this approach:

1. The laws of physics are reversible because processing is reversible<sup>10</sup>.

<sup>9</sup> Hence making a photon reverse direction also reverses its spin.

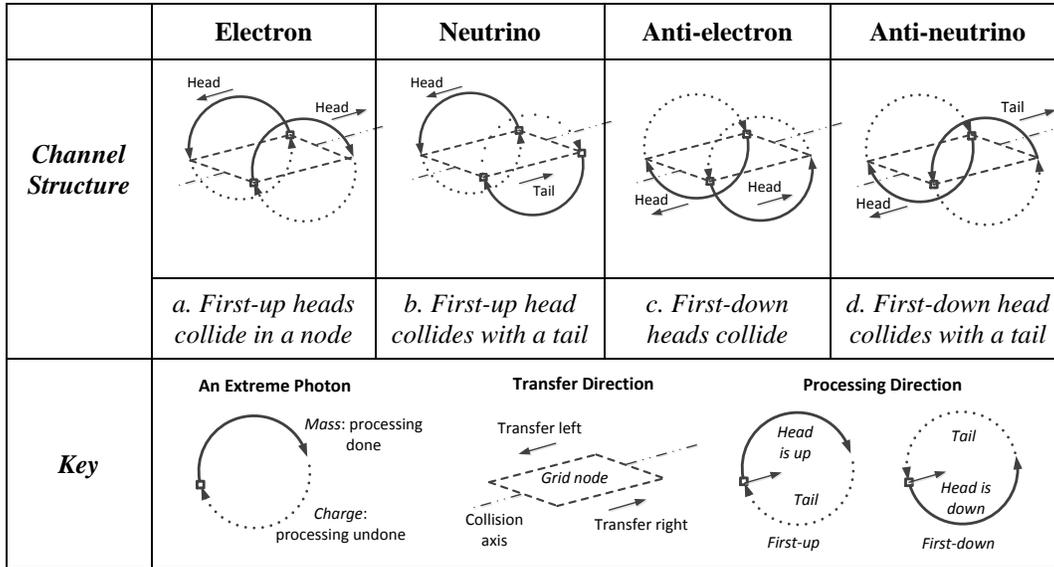


Figure 4.7. Lepton channel structures charge and spin.

2. Electrons and positrons annihilate into space plus photons that escape.
3. Quarks and anti-quarks as three-axis collisions don't annihilate (see 4.7.7 on mesons).
4. Some mesons are their own anti-particles because their processing reversed is the same.

In the standard model an electron has no structure but in this model it has a photon structure that defines its mass,

### 4.3.5. Where is the anti-matter?

Physics discovered that anti-matter was possible in some accelerator collisions but has never really explained it. In the standard model, matter and anti-matter are symmetric, so while in our universe negative electrons orbit positive atomic nuclei, in an anti-universe positive electrons would orbit negative nuclei. It would seem the same to its inhabitants because the laws of physics would be the same, so why is there matter all around us? Did the big bang produce:

- 1) No anti-matter, for some unknown reason?
- 2) Matter and antimatter equally, but the antimatter side of the universe is hidden?
- 3) Matter and antimatter equally, but matter somehow “overcame” antimatter?

Physics dismisses the first option by symmetry and the second because no anti-meteors, anti-planets or anti-stars are seen, so the current view is that the big bang made equal amounts of matter and anti-matter, as per the standard model, then “somehow” matter overcame anti-matter. That no data or rationale support this idea is called a “mystery” of physics:

*“The lack of anti-matter is a deep mystery that cannot be explained using the Standard Model.”* (Oerter, 2006) p101

Some suggest the universe is just a massive matter and anti-matter fluctuation that popped out of space and is still adjusting today, but the first event also created space, so if matter popped out of space what did space pop out of? Quantum fluctuations *in* space can't create space.

In this model, four originally equivalent dimensions separated into the three that constitute the surface we call space and the one that allows the transverse vibrations whose cycles we call time (Hawking & Hartle, 1983). In the first event *one* grid node *moved* to create one photon in one volume of space (see 2.5.1). This rip in the original bulk then cascaded, in the faster-than-light expansion physicists call *inflation*<sup>11</sup>, as the grid tore itself apart to create the free processing of our universe. Each photon created also made a point of space, so the expansion of space weakened the photons causing the chain reaction until it stopped. So the big bang wasn't big, at first anyway, and was a rip in the quantum fabric not an explosion into a pre-existing space. The universe didn't begin as a massive singularity, as the equations imply, but as one photon in one volume of space that led to a plasma that was:

<sup>10</sup> Including the quantum wave equation.

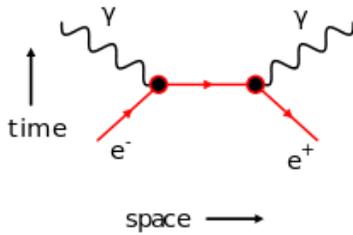
<sup>11</sup> In Guth's theory, an immensely strong anti-gravity field pulled the physical universe from the size of a proton to the size of a baseball faster than the speed of light, then 10<sup>-32</sup> of a second later that field conveniently disappeared forever from the universe.

“... essentially inhabited by massless entities, perhaps largely photons.” (Penrose, 2010) p176

In the beginning, there was light not matter, and when the first photon chose processing over anti-processing it made a universe of matter not anti-matter. So the anti-matter the standard model is trying to explain away, never was. The first photon chose to oscillate one way, and from then on anti-matter was a path not taken. No physical cause will ever explain why our universe is matter because that choice was made before the physical universe began.

### 4.3.6. Anti-time

An objective time passes regardless, but a virtual time passes by processing cycles, e.g. games measure time in frames-per-second (fps), as a screen can literally slow to a crawl if the computer is busy with a big battle. In our world, we also measure time by the event cycles of atomic clocks that literally slow down as they move more or are close to massive bodies, i.e. are under load.



The assumption that time always works the same way doesn't apply to anti-matter (Ambjorn, Jurkiewicz, & Loll, 2008), e.g. in the Feynman diagram of an electron hitting an anti-electron, the latter *enters* the collision going *backwards in time* (Figure 4.8). The logic is symmetric, so to the anti-electron the electron is going back in time, but both electron and anti-electron are *entering* the interaction not leaving it. In this model, Feynman diagrams need two time axes, one for matter *time* and one for anti-matter *anti-time*, because time is virtual.

Figure 4.8. A Feynman diagram

Anti-processing also explains why *time has an inverse*. Matter as processing experiences a tick of time for every forward cycle, and anti-matter as anti-processing experiences a tick of time for every backward cycle, so anti-matter exists in anti-time as matter exists in time. For matter, a forward cycle is a tick of time but for anti-matter a reverse cycle is a tick of its time. *To a matter being*, anti-matter runs time in reverse, but *to an anti-matter being*, we are the ones running time in reverse. Matter exists by processing and anti-matter by anti-processing so their processing existence defines their time. It is only possible for anti-matter to exist in anti-time if our time is virtual.

In contrast, to think that matter exists absolutely, in a single time, leads to theories that time itself is timeless, so every event that ever was or will be can be paged like a book (Barbour, 1999). Even Einstein wondered if we can go back and forth to different “slices” of time, although this denies causality and hence most of physics!

In quantum realism, time travel is impossible because it denies the *choice* upon which information is based (see 2.2.1). Choice by definition is to pick one option from a finite set, any of which could be chosen. If I can time travel to a set point in the future my choice now must be fixed, so it isn't a choice at all. Conversely, if I can go to the past to redo previous choices, my options now are undefined, so again choice is impossible<sup>12</sup>. If the physical world is a virtual reality, time travel is not possible.

A physical event as a reboot can't be reversed because by definition a reboot loses all prior information. A quantum entity can try every option in private, but public interactions on a network can't be undone<sup>13</sup>. So anti-matter can exist in anti-time *between* physical events, but can no more undo its interactions than matter can. In our universe, causality is sacrosanct, so physical events can't be reversed, rewound or fast-forwarded, whether by matter or anti-matter, i.e. there is no time travel. In this view the past is gone, the future is unknown, and there is only the eternal now.

## 4.4. QUARKS

Quarks constitute the nuclei of all the atoms that make up our world.

<sup>12</sup> If my going back in time causes my ancestor to die, I can't exist so can't choose to go back in time.

<sup>13</sup> Networks can't *locally* reverse interactions, e.g. a browser Back button can undo passive views but it must roll back both parties for interactions like registrations, so with six degrees of separation, rolling back six events for one person could roll back the entire web.

#### 4.4.1. A threefold collision

If neutrinos are strange then quarks are stranger, as their charges come in unexpected *thirds* and the force that binds them *increases* with distance, yet they still obey Einstein's equation so are matter just like electrons.

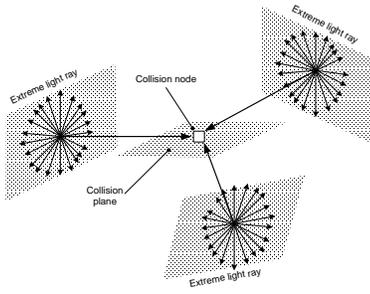


Figure 4.9. Three extreme light rays collide

bandwidth is reached and a standing wave repeats this every cycle. Yet this logic can't fill the channels of a two dimension plane because that needs four photon sets colliding, not three<sup>15</sup>. It is because the photons that constitute a quark can't fully occupy all the channels of a plane that quarks are not stable alone.

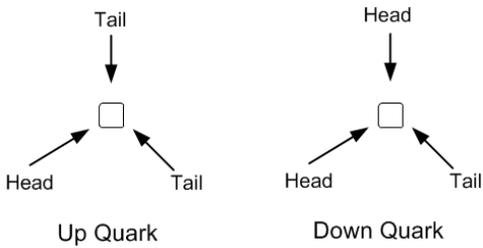


Figure 4.10. Up/down quark structure

*tails fill channels first.* There are then the following meet options:

#### 4.4.2. A three-way structure

The channel bandwidth for a node plane is two Planck sets, so in a three axis collision each axis fills at two-thirds of a Planck set. A three-way meeting also raises the issue of order, as photons compete for channels on a first come first served basis. If a photon head entering a node meets a photon tail leaving it, the tail must start before the head or it would be a head, giving the rule that

1. *Head-head-head:* Three heads meeting at equal angles in a node allot processing equally to all axes, and so only partly fill all of them. Every axis has free channels that allow a colliding entity entry to usurp the node, and so the result isn't stable.
2. *Head-tail-tail:* If two extreme photon beams leave a node as another arrives, the tail sets first fill one axis with a plus two-thirds charge left over, then the remaining tails and the later heads fill a neutral axis, leaving a sixth of a Planck set free in a third axis (Figure 4.10a). The result, of two full axes, one

Table 4.3. Quark processing details by axis

QUARKS	Photon sets	Axis processing (in Planck sets)		
		Charge	Neutral	Free
Up Quark	Tail exits charge axis	-1/3	-1/6	
	Tail exits neutral axis	vs -1/3	-1/6	
	Head enters free axis	0	vs +1/3	+1/6
	<b>Total Processing</b>	<b>2/3 (full)</b>	<b>2/3 (full)</b>	<b>1/3</b>
	<b>Net Processing</b>	<b>-2/3</b>	<b>~0</b>	<b>±1/6</b>
	<b>Remainder</b>	<b>+2/3</b>	<b>0</b>	<b>0</b>
Down Quark	Tail exits neutral axis	-1/6	-1/3	
	Head enters charge axis	vs +1/3	vs +1/6	
	Head enters free axis	+1/6	+1/6	+1/6
	<b>Total Processing</b>	<b>2/3 (full)</b>	<b>2/3 (full)</b>	<b>1/3</b>
	<b>Net Processing</b>	<b>+1/3</b>	<b>~0</b>	<b>±1/6</b>
	<b>Remainder</b>	<b>-1/3</b>	<b>0</b>	<b>0</b>

with a two-thirds charge and one neutral, with free photons in a third, is an up quark.

<sup>14</sup> A photon moving on axis X has a quantum amplitude on axis Y cutting X that decreases as  $\text{Cos}(\theta)$ , where  $\theta$  is the angular displacement between X and Y. For a quark with three axes, each one has two others cutting it at  $60^\circ$ , where  $\text{Cos}(60^\circ)$  is one half.

<sup>15</sup> Three extreme light rays colliding gives 1.5 Planck sets but to fill the channels of a plane of two axes needs two Planck sets. In Table 4.3, three half Planck sets partition as  $\frac{2}{3}^{\text{rds}} + \frac{2}{3}^{\text{rds}} + \frac{1}{6}^{\text{th}} = 1.5$ , where each axis fills at a  $\frac{2}{3}^{\text{rds}}$  Planck set. The result is a half short of the two needed but gives an excess of free photons in one axis.

3. *Head-head-tail*: If one beam has passed through a node as the other two arrive, the tails first cancel out the opposing heads with no charge left over, then the heads and the remaining tails fill another axis with a minus third charge, leaving again a sixth of a Planck set again free in the third axis (Figure 4.10b). The result, of two full axes, one with a minus third charge and one neutral, with free photons in a third, is a *down quark*.

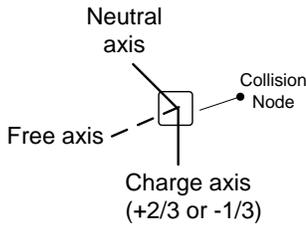


Figure 4.11. Three quark axes

The standard model *allocated* quark fractional charges after the fact, but this model *derives* them. Note: a tail-tail-tail meet is impossible because it implies a prior head-head-head event. So a quark occupies one node like an electron, but instead of filling the channels of only one axis it nearly fills those of a two-axis plane, which in the next section it does with the help of other quarks. For the details see Table 4.3, where again

mass is the net processing requested, charge is the net processing remainder, and an axis is full if the absolute processing equals its bandwidth. So quarks, like electrons, have a structure (Figure 4.11), as follows:

1. *Charge axis*. Holds the quark charge, of an up quark  $+2/3$  and a down quark  $-1/3$ .
2. *Neutral axis*. Heads and tails cancel with no remainder.
3. *Free photon axis*. The remaining one sixth Planck set of photons is “free”.

The axes are at  $60^\circ$  although the photons met at  $120^\circ$  because quarks are head-tail mixes. A head has a tail behind and a tail has a head in front, so one axis always goes the other way, to let quarks link in a triangle (see 4.4.4).

#### 4.4.3. The strong force

The strong force overcomes the huge electric repulsion of same charge protons to bind them in the nucleus of an atom. It has a very short range and the peculiar property that it gets *stronger* as quarks get further apart. It exchanges no energy so it isn't electro-magnetic, and it increases with distance so it isn't gravity. The standard model answer was a new *strong field*, new gluon *bosons* and a new *color charge*, whose red, blue and green

values cancel to white as positive and negative charges give neutral. Massless gluons now carry red, blue and green charges that bind quarks in a proton, just as photons bind electrons to a nucleus but with three values not two. A red quark is turned blue by gluons, but three colors need anti-colors, so to turn a red quark blue needs an anti-red gluon and a nearby blue gluon as well. Yet the calculations worked, so when in 1978 the PLUTO project managed to interpret a three-jet Upsilon event in gluon terms, they joined the standard model pantheon. No-one asked why a *universal* field was needed for a *quark-only*

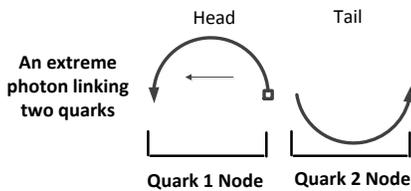


Figure 4.12. One photon in two quarks

effect.

In this model the strong force arises when quarks *share photons*, as an extreme photon can have its head in one node and tail in the other (Figure 4.12). The link increases with distance because as quarks separate the wavelength of the shared photon increases, releasing the energy to pull them together. In the next chapter, matter moves by reboot teleportation, so stretching a shared photon increases the processing in the gap, making the quarks more likely to reboot there<sup>16</sup>. The more quarks separate the more processing is in the gap and the stronger the effect. Shared photons act like elastic bands, so quarks experience no force when close but the more they separate the more strongly they are pulled together. Note that:

1. One photon running in two quarks does double duty, with no remainder.
2. Extreme photons with a two node wavelength can only link to adjacent quarks.
3. Quark charge is unaffected because the charge axes aren't involved.

The strong force is a processing option that arises in quarks because they have *excess processing* and electro-magnetism is an effect that arises in electrons because they have a *processing remainder*.

<sup>16</sup> In the Chapter 5 all matter “moves” by probabilistic reboot, so at  $10^{43}$  cycles a second, any processing bias gives movement.

#### 4.4.4. Protons and neutrons

Table 4.4. Quarks give protons and neutrons

	Quark 1	Quark 2	Quark 3	Charge
<b>Proton</b>	Up $+\frac{2}{3}$	Up $+\frac{2}{3}$	Down $-\frac{1}{3}$	+1
<b>Neutron</b>	Up $+\frac{2}{3}$	Down $-\frac{1}{3}$	Down $-\frac{1}{3}$	0

other entities out. An electron does it for one axis, but quarks must work together to fill all the channels of a plane.

Table 4.5. The strong link completes quark 1

	Quark 1 Free Axis	Quark 2 Neutral Axis
A. The free photons of quark1 insert their tails into quark2	$[\frac{1}{6}^{\text{th}}] \text{ ----} \rightarrow$	$(-\frac{1}{6}^{\text{th}})$
B. Quark2 photons reciprocate	$(-\frac{1}{6}^{\text{th}}) < \text{----} [\frac{1}{6}^{\text{th}}]$ $(-\frac{1}{6}^{\text{th}}) < \text{----} [\frac{1}{6}^{\text{th}}]$ $(-\frac{1}{6}^{\text{th}}) < \text{----} [-\frac{1}{6}^{\text{th}}]$	$-\frac{1}{6}^{\text{th}}$
C. The quark 1 extra minus processing cancels the positive quark 2 remainder		$+\frac{1}{6}^{\text{th}}$
<i>Total Processing</i>	$\frac{2}{3}^{\text{rds}}$ (full)	$\frac{2}{3}^{\text{rds}}$ (full)

channel it can. If a request fails, because another got there first, the photon just tries again. Processing fills channels as water fills stacked wine glasses - if one is full it just flows to the next until every glass is full and every molecule of water is allocated to a glass, with no central control needed. In this analogy, when all the water (processing) fills all the glasses (channels), the system restarts, i.e. the glasses empty and the water pours again in the next cycle. Protons and neutrons form because they are *stable*, i.e. standing waves that resist change by occupying all the channels of two dimensions, not because some invisible force made them do it.

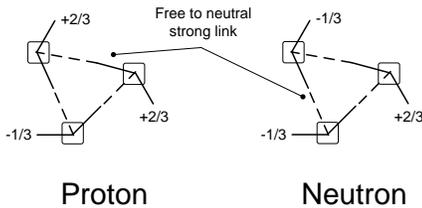


Figure 4.13. Proton and neutron structures

A neutron that is stable in a nucleus turns into a proton after about fifteen minutes alone in empty space, so one of its down quarks must have become an up quark to make the whole a proton. The standard model needed *something to make* this happen, and the strong force gluons couldn't do, so it had to invent a new *weak* force, that:

1. *Violates parity-symmetry.* Weak interactions are left-right different.
2. *Affects all particles.* Electromagnetism affects only charged/magnetic particles, strong force gluons affect only quarks, but the weak force affects all particles.
3. *Has no bound states.* Electromagnetism binds atoms in molecules, the strong force binds nucleons in the nuclei, gravity binds stars in galaxies, but the weak force binds nothing.
4. *Is asymmetric.* Neutrons decay into protons, but protons only turn into neutrons in stars.

Neither strong nor electro-magnetic forces act like this, so the standard model had a new challenge, which it met by the now standard practice of inventing a new *field* with new *bosons* and new *charges*. The equations worked, and the new *isospin* charges ( $+\frac{1}{2}, -\frac{1}{2}$ ) were retro-fitted so charm quarks interacted with down quarks but not up quarks, etc.

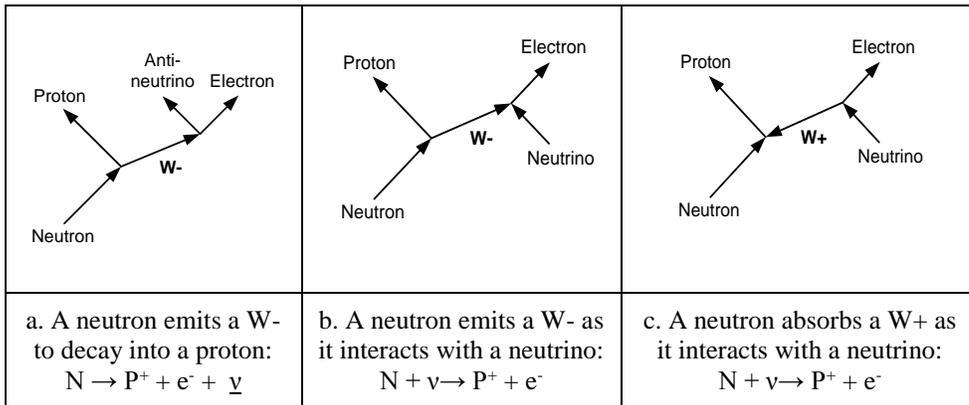
The atomic nucleus was thought indivisible, then it was found to consist of protons and neutrons that are now known to be made of quarks. If a proton is two up quarks and a down and a neutron is two down quarks and an up, the odd quark charges add nicely to give a positive proton and a neutral neutron (Table 4.4). A processing wave entity “survives” by filling all available channels to keep

If one quark’s free photons insert their tails into another quark’s neutral axis (Table 4.5A) and the displaced photons return the favor, they fill its free axis (Table 4.5B) and the left-over processing cancels (Table 4.5C), i.e. the first quark completes. If the second quark does the same to a third quark it also completes, and the third quark can link back to the first to give a self-contained entity where photon sharing fills the deficit of all three quarks. This triangle structure is a proton or neutron depending on the quark mix (Figure 4.13).

Each quark needs a different axis setup to link in a triangle so the standard model’s red, blue and green “charges” are *orientations*. Quarks as inert things need invisible agents to alter them, but for waves change is built in. Photons competing for channels naturally fill them not by central control but as each streams to any

#### 4.4.5. The weak force

The only problem was that the new bosons were heavier than protons, and a field *absorbing and emitting mass* was unheard of, but the norm for proving a field was now just that the equations worked, and the postulated virtual agents



matched energy resonances among the billions of accelerator collisions. So when in 1983 CERN found million, million, million, millionth of a second values in the expected range, weak bosons immediately joined gluons in the standard model pantheon. On this flimsy evidence, physicists today believe that:

*“Experiments have observed three bosons that carry the weak force”*  
 (Marburger, 2011) p221.

Figure 4.14. Standard model neutron decay routes<sup>18</sup>

But what physics calls an observation. CERN didn't observe anything *carrying* the weak force, it just observed something somewhere. No law court would accept that finding a knife matching a murder weapon made it the murder weapon, so why does physics accept the equivalent? No evidence at all linked the signal CERN found to the weak effect but it fitted the particle bias and so it was accepted that a neutron decays when a *tiny* down quark emits a *massive* W boson into an *invisible* field<sup>17</sup>. The equations testified that a neutron could decay in any of three ways, as it could:

1. Emit a  $W^-$  that decays into an electron and anti-neutrino (Figure 4.14a), OR
2. Emit a  $W^-$  boson that is hit by a neutrino to give an electron (Figure 4.14b), OR
1. Interact with a neutrino and a  $W^+$  boson to give an electron (Figure 4.14c).

Three causes for one effect might seem better than one but are three alibis for a murder better than one? That a quark

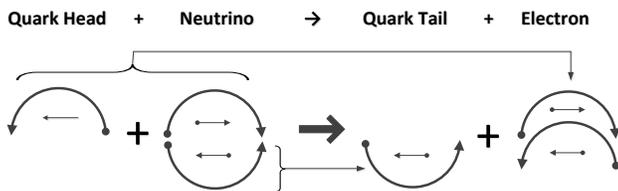


Figure 4.15. A neutrino converts a quark head into a tail

*could* emit a  $W^-$  into a field or *could* absorb a  $W^+$  from one is the sort of after-the-fact reasoning science was designed to protect us from. Nothing in the equations denied the reverse, so protons should decay too leading to a fruitless thirty year search for proton decay - currently the free proton half-life is estimated at over a billion, billion, billion years<sup>19</sup>. All this not to predict anything but to justify *renormalization*, the mathematical trick that makes the infinities of field theory go away if particles interact via other particles, not directly<sup>20</sup>, i.e. pulls physical reality from the quantum hat.

Reverse engineering suggests another alternative. If a down quark is a *head-head-tail* photon set mix, and an up quark is *head-tail-tail* set, a neutron will become a proton if a set of photon *heads become tails*. If a neutrino hits a quark the right way the processing can rearrange so every quark head becomes a tail for one axis, as Figure 4.15 shows for one channel. This doesn't alter the net remainder so it isn't electromagnetic, no photons are shared so it isn't strong, and it affects any head/tail photon mix, i.e. all matter.

<sup>17</sup> A down quark of mass 4.8 MeV “emits” a W boson of mass 80,400 MeV!

<sup>18</sup> From <http://hyperphysics.phy-astr.gsu.edu/hbase/forces/funfor.html#c5>.

<sup>19</sup> For the massive Kamioka experiment, see: <http://www-sk.icrr.u-tokyo.ac.jp/whatsnew/new-20091125-e.html>

<sup>20</sup> Called Yang-Mills interactions.

If a neutrino hitting a neutron just right can make it a proton then beta decay, as its equation implies<sup>21</sup>, is due to neutrinos all around us, which predicts that a neutron in a space with no neutrinos won't decay. Conversely, a proton needs an electron hit to turn its tails into heads, but to get an electron alongside a quark takes a lot of energy, so proton decay only occurs in the hearts of stars. Again, W bosons, like gluons, are unnecessary agents.

#### 4.4.6. The Higgs emperor

The mass of weak field bosons had to come from somewhere, so the standard model answer was, of course, *another field!* The Higgs was needed to sustain the model that sustained the particle business, so soon the search for it became the holy grail of physics, attracting over 30 billion dollars in funding. When in 2012, after a five decade search, CERN found a resonance in the right *range*<sup>22</sup> physicists the world over breathed a sigh of relief - the standard model lived on! Finding a 125GeV signal a half bigger than anything found before wasn't easy, but *the Higgs emperor has no clothes* because:

1. *It adds no value.* The Higgs adds no value to general relativity, our best theory of mass to date, or explain the dark energy and dark matter that is most of the universe. A million, million, million, millionth of a second CERN effect can't explain gravity that acts over light years. The Higgs only exists to rescue the standard model:

“... *the Higgs field allows us to reconcile ... how ... weak interactions work, that's a far cry from explaining the origin of mass or why the different masses have the values they do.*” (Wilczek, 2008) p202

2. *It is circular.* A circular argument presumes its conclusion, such as saying a person must be guilty because they were charged, and a particle with mass creating mass is equally circular. What gives the Higgs mass? If it is another Higgs, what gives it mass, and so on? A Higgs that begets itself is indeed a God particle! If *the field itself* creates the mass as some suggest, what does the Higgs boson do? Wasn't it to avoid invisible fields causing visible effects that bosons were invented in the first place? Like doesn't have to make like. Just as water comes from hydrogen and oxygen gases that aren't themselves watery, so mass can come from massless photons.
3. *It contradicts quantum theory.* All quantum particles with mass are spin-half particles and mass without spin contradicts quantum theory, so a massive spin-zero point particle is impossible (Comay, 2009). All point particles spin and only matter-antimatter mixes like mesons have spin zero.
4. *A signal isn't an effect.* No evidence links the signal CERN found to mass creation. If finding a resonance proves a virtual cause does not finding one deny it, as no gravitons have been found? One can't have it both ways.
5. *It could be a meson.* In a carefully crafted press release, CERN claimed that zero-spin would confirm the Higgs, then found it so. But not-yet-found higher order mesons also have zero-spin, are in that mass range and have the same photon decay and detection frequency<sup>23</sup>. That this is a top or anti-top meson hasn't been eliminated.

The Higgs logic adds nothing to our best theory of matter, is circular, contradicts quantum theory, has no causal base and didn't eliminate a likely alternative. That what at best explains at best a tiny percentage of the mass of the universe is now seen as the origin of mass is a tribute to the power of marketing, not science. The Higgs is the invisible field invented to explain the invisible field that was invented to explain an actual effect. By piling theoretical entities upon each another, the standard model has become a theoretical house of cards.

#### 4.4.7. Mass is processing

In physics, an object's mass was first thought of as weight, or *gravitational mass*, but after Newton mass also became the force needed to move it, i.e. *inertial mass*. They are not the same, as an object that is weightless in space still needs a force to move it, so it still has inertial mass. If momentum is mass times velocity, a massless photon should have no momentum but solar sails move when the sun shines on them and photons are bent by the gravity of the sun, so Einstein

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<sup>21</sup> In beta decay, neutrons convert to protons by the equation:  $N + \nu \rightarrow P^+ + e^-$ , as a neutron is hit by a neutrino. Protons become neutrons by inverse beta decay:  $P^+ + e^- \rightarrow N + \nu$ , as a proton is hit by an electron. Why insert fictional bosons into these equations?

<sup>22</sup> The researchers note: “*The theory does not predict a specific mass for the Higgs boson.*” (CMS collaboration, 2012), so any high mass particle would have done the job.

<sup>23</sup> See <http://nohiggs.wordpress.com/2012/07/15/the-new-125-gev-particle/> for details.

proposed that a photon with no *rest mass* gains *relativistic mass* as it moves, and so momentum<sup>24</sup>. So while mass began simple it is today a complex concept, as some even wonder if dark matter is a property of space, i.e. if space has mass.

	Matter	Anti-Matter
Space		
Extreme photon		
Electron		
Neutrino		
Up quark		
Down Quark		

Figure 4.16. The basic processing combinations

In Chapter 2 space was a null program, so empty space isn't empty at all. In Chapter 3 every photon was the same code distributed more or less, so the entire electromagnetic spectrum was built from one program. In this chapter matter is a system glitch, a program exception that repeats forever and change the left-over code that never runs. This connects space, light, matter and charge in a very economical way, as in *processing* terms energy is a *transfer rate*, mass is a *demand* and charge is the *remainder*, all at the node, as follows:

1. *Space*. Empty space is one Planck program running in one node. The net processing is zero so it has no mass, the transfer rate is zero so it has no energy and a zero remainder means no charge.
2. *Photon*. A photon can't stop to be weighed but it has a net processing per cycle per node so it has mass. The nodes of its wavelength transfer processing at some rate so it has energy, and no processing undone means it has no charge.
3. *Electron*. An electron fills the channels of a node axis with positive instructions. It has net processing so it has mass, and the remainder gives a negative charge. The next chapter covers movement and kinetic energy.
4. *Neutrino*. A neutrino's axis channels are filled with positive and negative instructions that nearly cancel to give a tiny mass but opposite direction photons mean the remainders do cancel to zero charge. It isn't space as it is two Planck programs while space is just one.
5. *Quark*. A quark is a three-way photon collision that can't quite fill the channels of a plane. Being symmetric its net processing repeats so it has mass, and the remainder is in one-third charges according to the phase (up or down).

6. *Anti-matter*. Anti-matter versions of electrons, neutrinos and quarks are derived by reversing the processing. The net processing demand is the same giving the same mass, and an opposite remainder gives an opposite charge.

All the basic entities of physics can be represented as processing wave combinations (Figure 4.16).

#### 4.4.8. The energy of matter

*Bohr's equation* is that the energy of a photon is its frequency multiplied by Planck's constant (see 3.2.8). If a photon is a Planck program spread out, the data throughput per node, or energy, reduces as more nodes share the same program, so as wavelength increases energy decreases. Conversely as wavelength decreases, fewer nodes running the same program increase the energy transfer rate. Each node of a shorter wavelength gets a bigger share of the program and runs it more often per second, so a photon's energy increases with its frequency. More exactly, if Planck's constant is the transfer of

<sup>24</sup> Relativistic mass is defined by special relativity. Rest mass is mass with no relativistic effects.

one Planck program per second, the node transfer rate (energy) will be Planck's constant times its frequency, i.e. Bohr's equation<sup>25</sup>. It is also Planck's constant divided by its wavelength times the speed of light<sup>26</sup>.

*Einstein's equation,  $E=mc^2$* , does for matter what Bohr did for light – defines its energy. In 1905 he deduced that the energy of matter is its mass times the speed of light squared, and nuclear bombs confirm this, but it has never been clear why mass relates to light at all. If mass is something inherent, why does its energy relate to the speed of light? In this model, an electron is many channels filled with light waves repeatedly colliding. Each channel contains the equivalent of a photon with a one node wavelength, whose energy by Bohr's equation is Planck's constant times the speed of light divided by one Planck length. Planck's constant is one Planck program of mass transferred over a Planck length squared per Planck time, so substituting for Planck's constant in Bohr's equation gives Einstein's equation for mass and energy<sup>27</sup>.  $E=mc^2$  because matter is light condensed, vibrating at the refresh rate that also defines the speed of light.

## 4.5. FIELDS UPON FIELDS

A century of physics has produced a model of invisible fields whose virtual particles cause all the forces of nature. There is no doubt the equations work, but does Nature really consists of fields upon fields?

### 4.5.1. The frog in the pan

Faraday's invention of an invisible field around an electric charge was considered fanciful until Maxwell's equations defined it, but today fields explain everything in physics. A field is a *disembodied force* that can mediate an effect at a distance, and even Newton, centuries earlier, had issues with this:

*“That gravity should be innate, inherent and essential to matter, so that one body may act upon another at a distance thro' a vacuum, without the mediation of anything else ... is to me so great an absurdity, that I believe no man ... can ever fall into it. Gravity must be caused by an agent...”* (Oerter, 2006) p17

Maxwell deduced his equations from ball-bearings twisting in vortex tubes, but his physical model didn't work as a theory. The Newtonian mindset needed a force-carrier, as if a magnetic field moves an iron filing some *agent* must do that, so *field theory* came up with *boson agents*, virtual particles that cause an effect and are instantly consumed by the act e.g. the boson agent for gravity is the graviton. The standard model was born when Maxwell's equations described Faraday's fields as virtual photon transfers. They were unobservable, but photons existed and their actions could be *seen in the equations* - by the initiated. Postulating invisible photons that no-one could see in action seemed a small price to pay to confirm that only particles caused forces.

However the model then grew by analogy, as new forces coming along needed new fields: the strong force needed a strong field, the weak force needed a weak field and the weak field needed the Higgs. Each new field came with virtual particles to cause its effects: electro-magnetism had photons, the strong field had gluons, the weak field had its bosons and the Higgs field had the Higgs boson. The force of gravity stubbornly resisted as no gravitons were found, but as physics pasted field upon field, the original massless, charge-less photons were joined by gluons with color charge, weak bosons with mass, and a Higgs so big it needs a billion dollar accelerator to find it. All this, to support the canon that:

*“...the forces of Nature are deeply entwined with the elementary particles of Nature.”* (Barrow, 2007) p97

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<sup>25</sup> Let one photon be a Planck program distributed over the nodes of its wavelength. If energy  $E_P$  is the net transfer rate at a node, Planck's constant  $h_P$  is the transfer of one Planck program a cycle, and the frequency  $f$  is how often a photon program cycles per second at a point, the net transfer rate at a node must be the transfer rate of one Planck program per cycle times the frequency, i.e.  $E_P=h_P.f$ , or Bohr's equation  $E=h.f$ .

<sup>26</sup> If wave velocity  $v=\lambda.f$  then for a photon  $c=\lambda.f$ . So  $E_P=h_P.f$  becomes  $E_P=h_P.c/\lambda$  for any photon.

<sup>27</sup> In this model, the speed of light  $c=L_P/T_P$ , for  $L_P$  Planck length and  $T_P$  Planck time. A photon's energy  $E_P=h_P.c/\lambda$ , for  $h_P$  the energy of a Planck program transfer,  $c$  the speed of light and  $\lambda$  the wavelength. In an electron  $\lambda$  is one node, so  $E_P=h_P.c/L_P$ . If mass  $m_p$  is the program that repeats,  $h_P$  transfers  $m_p$  over a Planck length square every cycle, i.e.  $h_P=m_p.L_P.L_P/T_P$ . Substituting gives  $E_P=m_p.L_P.c/T_P$ , or  $E_P=m_p.c^2$ . This derivation doesn't prove  $E=mc^2$ . Einstein did that based on how our physical world behaves. It just finds this model consistent with Einstein's equation.

In current physics, invisible photon agents pop in and out of the electro-magnetic field to cause its effects. They can't be seen because the field creates them and the effect absorbs them, so to see one is to destroy it. Yet *the facts are* that electro-magnetic changes occur in photon amounts and that photons exist, and from this virtual photons were *deduced*. Once the logic was accepted, other effects just needed an energy resonance matching an equation term to become a virtual cause. Virtual particles are a physics blank check, able to explain any digital change if particle accelerators find a match among their billions of events. Once physics accepted invisible causes it couldn't go back, and each new field weakened it scientifically, like a frog in a pan of water heating up<sup>28</sup>, until now it is enmeshed in a fiction it can't escape from.

#### 4.5.2. There are no bosons

A processing model sees the same facts as the standard model but explains them differently, e.g. electro-magnetic changes occur in photon units because a Planck program is the basic grid operation, i.e. the source of every photon is the unit of electro-magnetic change. Electromagnetic effects *look like photon effects* because both have the same source, but the link is only a correlation, and confusing correlation and causation is one of the oldest errors in science<sup>29</sup>.

A static world needs agents to change it, but a dynamic system changes with no agents needed, e.g. an electron can fall to a lower energy orbit without an "orbit boson" making it do so. If change is built in the question isn't why things change but why sometimes they don't. A systems answer is that some changes are irreversible, e.g. when an electron in an atom drops to lower orbit, the atom emits a photon representing the energy difference. So the electron is stuck in the lower orbit because the photon has left and it can't return unless some external energy source bumps it back up. Likewise, dynamic systems like Conway's Life form static *end-states* of shapes that repeat forever, and in this model matter is just that.

In this model the forces of physics arise naturally from dynamic processing, as follows:

1. *Electro-magnetism.* The standard model attributes electro-magnetism to virtual photons but a processing model sees the same facts as a digital system changing in Planck program units, i.e. photons exist but virtual photons don't.

The Six Leptons		The Six Quarks	
electron	electron neutrino	up	down
muon	muon neutrino	strange	charm
tau	tau neutrino	top	bottom
photon	gluon	W Z	graviton

The Four Force-carrying Particles

2. *The strong effect.* The standard model needed a new invisible field, three charges and eight bosons to explain the strong effect, but in this model quarks with free photons just share them to strongly link. The color charge that was argued by analogy is just an axis *orientation* that changes naturally, with no magical gluon agents needed.

3. *The weak effect.* The standard model took another field, three more bosons and two new charges to explain beta decay, and still couldn't say why protons don't decay. In this model it is just a neutrino effect, and reverse beta-decay is an electron effect that only occurs in stars. Weak bosons are again unnecessary imaginary agents.

4. *The Higgs.* If weak bosons don't exist, the Higgs boson isn't needed. CERN just added yet another species to its already overflowing menagerie of transient and pointless "particles", as what is transient is not fundamental.

5. *Gravity.* Gravity was the first field and every attempt to find gravitons has failed, but standard model iconographies still display it as if it were proven (Figure 4.17). No particle exchange model of gravity can ever emerge, as bosons **in** a space-time canvas can't alter space or time as gravity does. In Chapter 5 gravity is the *grid processing gradient*.

Figure 4.17. The standard model iconography<sup>30</sup>

<sup>28</sup> In this story, a frog dropped in a pan of hot water jumps out immediately, but if put in tepid water that is slowly heated, by the time it sees the problem it is too weak to jump out.

<sup>29</sup> For example, there is a correlation between the ice-creams sold in America and deaths by drowning, so do ice-creams kill? In Europe, the number of stork nests correlate with the human babies born, so do storks bring babies? In these cases X and Y correlate because both are caused by a third agent Z, namely the weather, not because they cause each other. Correlation is not causation.

<sup>30</sup> From CERN's website <http://www.lhc-closer.es/1/6/1/0>

As the standard model pastes *field upon field* their virtual particles must interact, as the Higgs boson gives W bosons mass, but how? What rules define this new world of virtual particles? A quark feels the electric, magnetic, strong, weak, Higgs and gravity forces, so if a virtual photon, gluon, weak boson, Higgs and graviton appear *at the same time*, how do they interact? If a Higgs creates matter and an anti-Higgs creates anti-matter, what happens when they meet? To say that virtual bosons only interact when our equations require it is quite unsatisfactory.

For each new *effect* the standard model invented a new *field*, but a processing model has only one *quantum field*, the grid network, and one fundamental entity, the *Planck program*. There is no need for virtual particles to do the dirty work of fields if electro-magnetism is a Planck program change, the strong effect is photon sharing, the weak effect is a photon head-tail swap, and the Higgs and graviton are just fictional.

### 4.5.3. Occam's Razor

Occam's razor, not to multiply causes unnecessarily, is the pruning hook of science, without which dominant theories would never fall. Last century the standard model was a simple theory of mass, charge and spin but today it needs isospin, hypercharge, color, chirality, flavor and other esoteric features to work. This theory of sixty two core particles<sup>31</sup>, five invisible fields, sixteen charges and fourteen bosons (Table 4.7) has so many ad-hoc properties that if it were a machine, one would have to hand-set over two dozen knobs just right for it to light up. If the standard model is preferred today, it isn't because of its simplicity.

Table 4.7. Fields, charges and bosons of the standard model

Field	Charges	Bosons
<i>Electro-magnetism</i>	+1, 0, -1	Photon (1)
<i>Strong</i>	Red, Green, Blue, White, Cyan, Magenta, Yellow, Clear	Gluon (8)
<i>Weak</i>	$+\frac{1}{2}, 0, -\frac{1}{2}$	W <sup>+</sup> , W <sup>-</sup> & W <sup>0</sup> (3)
<i>Gravity</i>	1?	Graviton (1?)
<i>Higgs</i>	1?	Higgs particle (1?)
<b>Total = 5</b>	<b>Total =16</b>	<b>Total =14</b>

For this complexity one might expect completeness, but the standard model can't explain gravity, proton stability, anti-matter, quark charge, neutrino mass, neutrino spin, family generations, quantum randomness or inflation. In addition it doesn't explain dark energy or dark matter, i.e. *most of the universe*. And every time it explains something new, *it grows*, e.g. inflation needs a new inflation field<sup>32</sup> and to explain neutrino mass needs another 7-8 arbitrary constants:

*"To accommodate nonzero neutrino masses we must add new particles, with exotic properties, for which there's no other motivation or evidence."* (Wilczek, 2008) p168.

The standard model *feeds* on the data around it<sup>33</sup>.

### 4.5.4. The standard model toolkit

The standard "model" is actually a *model toolkit* that can handle anything *after it occurs*. Its job is not to predict data but to absorb it, so when anti-matter was found it added new columns and when family generations came along it added new rows. When mesons were discovered someone asked "*Who ordered that?*", but it just made them bosons that carried no force! When new facts arrive, the standard model builds a new wing to accommodate them or uses an existing one.

It is hard to pin down a "model" that morphs with each new result, e.g. the standard model includes gravitons that a long search hasn't found, so was that a fail? It predicted proton decay but twenty years of experiments have pushed their lifetime to that of the universe, so was that an error? It considers matter and anti-matter symmetric, so does our universe of matter contradict it? It predicted massless neutrinos until oscillation experiments gave them mass, and penta-quarks and strange quarks until a two decade search found neither. Today it predicts that weakly interacting particles (WIMPs) will

<sup>31</sup> Two leptons with three generations plus anti-matter variants is 12. Two quarks with three generations plus anti-matter variants and three colours is 36. Plus one photon, eight gluons, three weak bosons, one graviton and the Higgs is another 14. The total is 62.

<sup>32</sup> A hypothetical *symmetron field* has been proposed to explain inflation post hoc.

<sup>33</sup> Like the plant in [The Little Shop of Horrors](#) movie, the standard model feeds on what is around it.

explain dark matter, but again a long search has found nothing. When the facts cut off one “head” of a standard model theory, like a hydra, it just grows another. Indeed it is unclear what exactly it would take to falsify a model whose failures are called “*unsolved problems in physics*”<sup>34</sup>, as each setback is just another chance to tweak it.

Standard model equations can calculate results to  $10^{12}$  decimal places but a *reliable* formula isn’t a *valid* theory until it predicts. Equations that *interpolate* between known points aren’t theories that *extrapolate* to new points. An equation is data condensed mathematically, not a theory vision of the future. Today, generations of physicists, fed on equations not science (Kuhn, 1970), confuse equations and theory, and so Georgi was ignored:

“*Students should learn the difference between physics and mathematics from the start*” (Woit, 2007) p85.

The standard model claims it predicted top and charm quarks before they were found, but given three generations of leptons and two of quarks, expecting a third quark generation was like predicting the last move in a tic-tac-toe game. It says it predicted gluons, W bosons and the Higgs, but inventing invisible causes based on data-fitted equations isn’t prediction. Fitting equations to the data, then finding their terms match transient resonances in billions of accelerator collisions is the research version of reading tea leaves – if you look hard enough you will get a result<sup>35</sup>. The standard model grew itself, not our understanding, so its answer to why a top quark is 300,000 times heavier than an electron is still “*because it is*”. The issues that baffled the physics fifty years ago still baffle it today because equations can’t go beyond the data set they came from. The last time such a barren model dominated thought so completely was before Newton.

#### 4.5.5. The last standard model

In the second century, Ptolemy’s Almagest let people predict the movements of the stars for the first time, based on the idea that heavenly bodies, being heavenly, moved in perfect circles, or in circles within circles (epicycles), around the Earth. *It wasn’t true*, but the equations worked so for centuries Ptolemy’s followers calculated the stars by epicycles. As new stars were found, they amended the model, making it more complex and themselves more expert. This medieval standard model only fell when Copernicus, Kepler, Galileo and Newton developed a causal model to replace it. Today’s standard model operates like the Ptolemaic standard model because both are:

1. *Descriptive*. Descriptive models describe what is but not why it is so. Describing data patterns is the first step of science, as it develops *causal theories*.
2. *Parameterized*. Ptolemy’s model let experts choose the free parameters of *epicycle, eccentric and equant* to fit the facts<sup>36</sup>, just as the standard model of today lets experts choose the free parameters of *field, bosons and charge*.
3. *Retrospective*. Ptolemy’s model defined its epicycles *after* each new star was found, just as today’s standard model bolted on a new field *after* each new force was found.
4. *Barren*. Descriptive models can only interpolate, so the Ptolemaic model would *never* have deduced Kepler’s laws, and likewise today’s standard model will *never* deduce that matter is made of light.
5. *Complex*. Medieval astronomers tweaked Ptolemy’s model until it became absurdly complex, just as today’s standard model equations fill pages and those of its string theory offspring fill books.
6. *Normative*. The Ptolemaic model was the norm of its day, so any critique of it was seen as an attack on those in charge, and likewise today any standard model criticism is seen as an attack on physics itself (Smolin, 2006).
7. *Wrong*. Ptolemy’s model *mostly worked* although planets don’t move in circles around the earth, and likewise today’s standard model calculations *mostly work* although virtual particles don’t actually exist.

The standard model of physics is a *descriptive model* that should have evolved into a *causal theory*<sup>37</sup>. but nothing physical can explain quantum states, so it couldn’t, leaving physics with the following options: to deny meaning (the

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<sup>34</sup> See [https://en.wikipedia.org/wiki/List\\_of\\_unsolved\\_problems\\_in\\_physics](https://en.wikipedia.org/wiki/List_of_unsolved_problems_in_physics)

<sup>35</sup> The folded paper fallacy is to think of a shape, fold a paper many times, unfold it and look at the creases. Often the shape thought of is in the creases. If not, try again, as by Wyszowski's Second Law, *anything can be made to work if you fiddle with it long enough*.

<sup>36</sup> See [http://www.polaris.iastate.edu/EveningStar/Unit2/unit2\\_sub1.htm](http://www.polaris.iastate.edu/EveningStar/Unit2/unit2_sub1.htm)

Copenhagen view), to fantasize about many worlds (Everett, 1957) or to go it alone with pure mathematics (string theory). None of them worked out, leaving physics with a *descriptive model* not a *causal theory*. It considers this as good as it gets, and still claims that the electro-magnetic amplitude doesn't *really* exist, quantum waves don't *really* spread, nor do they *really* collapse, i.e. physics today is in denial of both science and its own theory!

When the medieval church pressured Galileo to recant they didn't ask him to deny the earth went round the sun, but to call it a mathematical fiction used by astronomers, not a reality description. Today, physicists voluntarily portray quantum theory in this ways, as a mathematical fiction not a reality description, as in Bohr's statement that:

*"There is no quantum world. There is only an abstract quantum mechanical description."* Newton, p244

In quantum realism there *really is* a complex dimension beyond our space, quantum waves *really do* exist, and they *really do* collapse instantly to a point, from anywhere in the universe, i.e. quantum theory is literally true.

#### 4.5.6. The particle myth

The standard model sees everything as a particle, like a boy with a hammer sees everything as a nail, but it can't say what these *particles* are actually made of. If pressed, it retreats to wave equations that don't relate to particles at all. This bait-and-switch, to show a particle but give a probability wave, works because scientists are trained to not look behind the curtain of physical reality<sup>38</sup>. When asked what it all means, they refer you to the same esoteric equations they just said were purely fictional! Feynman explains how this double-speak began:

*"In fact, both objects (electrons and photons) behave somewhat like waves, and somewhat like particles. In order to save ourselves from inventing new words such as wavicles, we have chosen to call these objects particles."* (Richard Feynman, 1985) p85

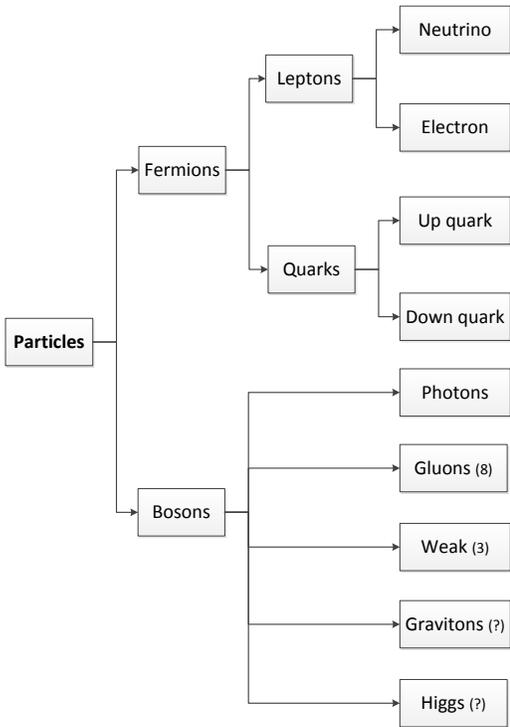


Figure 4.18. The standard model of particles

Yet breaking matter into its "fundamental particles" revealed what was:

1. *Impermanent.* Is a million, million, million, millionth of a second energy spike a particle? Do particles come and go like that?
2. *Insubstantial.* Particles should have an inherent substance, but mass today is a running value that varies with context.
3. *Classifiable.* Fundamental particles can't be classified by definition, but the standard model calls a tiny electron, a massive Tau and a positive anti-electron leptons.
4. *Subject to decay.* If a top quark with the mass of a gold nucleus of 79 protons and 118 neutrons is a fundamental particle<sup>39</sup> why does it decay? When a neutron emits an electron to become a proton, three fundamental particles become four, so how are they fundamental?

Entities that decay or transform into each other aren't fundamental, as what is fundamental doesn't break up or reform. Nor can what is classifiable be fundamental, as the classification implies something more basic. If a particle is substantial by its mass, why does it change with speed? A mass that comes and goes in a flash is an event not a particle. We don't call a stream eddy a thing so why call a transient quantum eddy a particle? It follows that the *fundamental particles of the standard model are neither fundamental nor particles.*

<sup>37</sup> In research methodology, after describing patterns comes correlation and then causation (Rosenthal & Rosnow, 1991). In scientific method terminology, current physics has stalled at the descriptive level.

<sup>38</sup> The Wizard of Oz tells Dorothy: "Pay no attention to that man behind the curtain", to distract her from what is really orchestrating events. Likewise physicists are asked to pay no attention to the quantum waves behind the curtain of physical reality.

<sup>39</sup> [http://www.eurekalert.org/pub\\_releases/2005-02/uor-nmu021005.php](http://www.eurekalert.org/pub_releases/2005-02/uor-nmu021005.php)

### 4.5.7. Less is more

Depending on your world view, the physical world consists of:

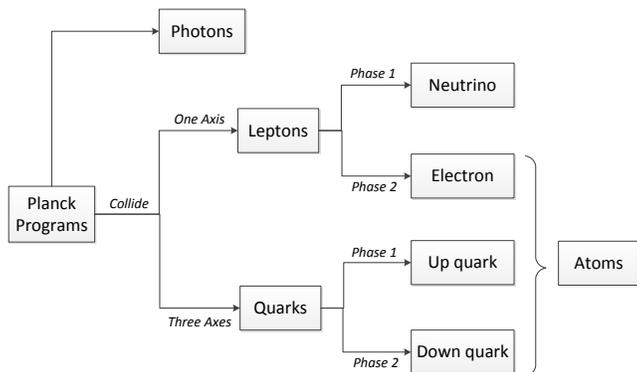


Figure 4.19. A quantum processing model

still pond, to create what we call light vibrating on the 3D surface we call space. The *first photon* spawned others that collided into the one and two dimensional standing waves we call electrons and quarks. The matter factories we call stars then built up the elements of the periodic table that evolved into life, and us. So mass came from light, fermions are made of bosons and there was no singularity.

It would be hard to find two views more radically opposed. The main differences are:

1. Matter inherently exists vs. it is made of light.
2. Everything is particle-waves vs. it is all waves.
3. The universe is decaying vs. it is evolving.
4. Matter is distinct from charge vs. they are related
5. A universe came from nothing vs. from a previous bulk.
6. A passive world vs. a world that changes itself.

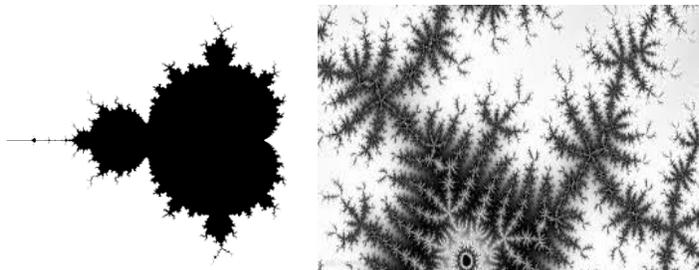


Figure 4.20. Mandelbrot's set, a. Main, b. Detail

the masses that the standard model currently just *allocates*.

### 4.5.8. Testing the theory

According to the standard model, matter collides by a basic substantiality that light does not have, so:

"Two photons cannot ever collide. In fact light is quantized only when interacting with matter."<sup>40</sup>

a. *Inherent particles.* Physical reality *divides* into the fermionic matter we see and virtual bosons that explain distant effects (Figure 4.18). The world *breaks down* into parts that are fundamental because *we can't* break them down further. In the beginning, a big bang *singularity* was the universe of matter as it is now but at a point. Matter and light are distinct, so an electron with mass can't come from massless photons, and a quark with color can't come from colorless photons.

b. *Processing events.* Physical reality was *constructed* from a *core program* that began it all as one photon (Figure 4.19). The world was *built up* from one fundamental entity, the photon. In the *first event*, a primal quintessence "moved", like a drop of water falling on a

7. The Higgs is critical by its mass vs. irrelevant by its transience.
8. Virtual bosons cause all forces vs. they don't exist at all.

The standard model assumes the universe's *complexity* can be *divided* into a Lego-set of fundamental pieces, but in this model that complexity is *simplicity combined*, just as one line of complex code repeated gives the endless Mandelbrot set (Figure 4.20). Reverse engineering the physical world will let us simulate it to *discover*

<sup>40</sup> Accessed August, 2010 from [http://en.wikipedia.org/wiki/Two-photon\\_physics](http://en.wikipedia.org/wiki/Two-photon_physics)

Quantum realism predicts that *extreme light in empty space will create matter*, and lest this seem fanciful note that:

1. *Photons confined have mass.* A free photon is massless but if confined in a hypothetical 100% reflecting mirror box it has a rest mass, because as the box accelerates unequal photon pressure on its reflecting walls creates inertia (van der Mark & t<sup>o</sup> Hooft, 2011). By the same logic, photons tangled in a grid node will have mass.
2. *Einstein's formula.* That matter is energy works both ways, so if nuclear bombs can turn mass into energy, photon energy can create mass. In the Breit-Wheeler equation, high energy photons can create matter.
3. *Particle accelerator collisions* routinely create new matter. Protons that collide and stay intact give new matter that didn't exist before. If this matter comes from the collision energy, why can't high energy photons do the same?
  1. *Pair production.* High-frequency light near a nucleus gives electrons and positrons that annihilate back into space.
  2. *Light collides.* When high-energy photons at the Stanford Linear Accelerator Center hit an electron beam accelerated at almost the speed of light, some electrons knocked a photon back with enough energy to hit the photon behind it, giving matter pairs that a magnetic field pulled apart to detect (Burke & et al, 1997).

That light alone can form matter is a testable prediction but the definitive experiment hasn't yet been done because it contradicts the standard model. When beams of pure light in empty space create matter the boson-fermion barrier will fall, and with it the standard model. The future of physics lies in merging light not smashing protons apart as a wave will never be understood by trying to divide it. When mankind replaces matter colliders with light colliders it will discover that the *physical universe* also evolved. Evolution isn't about oddities that don't survive, and the accelerators that physics is now pouring its money into are just finding combinations that don't work, of no significance in the scheme of things.

## 4.6. THE EVOLUTION OF ATOMS

The atoms of our universe didn't arise all at once but evolved over time, in a process called nucleosynthesis.

### 4.6.1. The nuclear structure

In the periodic table (Figure 4.21), a hydrogen nucleus has one proton and a helium nucleus has two protons plus 1-2 neutrons, but no-one knows what the extra neutrons do:

*"... all the stable nuclei have more neutrons than protons (or equal numbers), and the heavier nuclei are increasingly neutron-rich."* (Marburger, 2011) p254

hydrogen 1 H 1.0079																	helium 2 He 4.0026						
lithium 3 Li 6.941	beryllium 4 Be 9.0122																	boron 5 B 10.811	carbon 6 C 12.011	nitrogen 7 N 14.007	oxygen 8 O 15.999	fluorine 9 F 18.998	neon 10 Ne 20.180
sodium 11 Na 22.990	magnesium 12 Mg 24.305																	aluminum 13 Al 26.982	silicon 14 Si 28.086	phosphorus 15 P 30.974	sulfur 16 S 32.065	chlorine 17 Cl 35.453	argon 18 Ar 39.948
potassium 19 K 39.098	calcium 20 Ca 40.078	scandium 21 Sc 44.956	titanium 22 Ti 47.867	vanadium 23 V 50.942	chromium 24 Cr 51.996	manganese 25 Mn 54.938	iron 26 Fe 55.845	cobalt 27 Co 58.933	nickel 28 Ni 58.693	copper 29 Cu 63.546	zinc 30 Zn 65.37	gallium 31 Ga 69.723	germanium 32 Ge 72.61	arsenic 33 As 74.922	selemium 34 Se 78.96	bromine 35 Br 79.904	krypton 36 Kr 83.80						
rubidium 37 Rb 85.468	strontium 38 Sr 87.62	yttrium 39 Y 88.906	zirconium 40 Zr 91.224	niobium 41 Nb 92.906	molybdenum 42 Mo 95.94	technetium 43 Tc [98]	ruthenium 44 Ru 101.07	rhodium 45 Rh 102.91	palladium 46 Pd 106.42	silver 47 Ag 107.87	cadmium 48 Cd 112.41	indium 49 In 114.82	tin 50 Sn 118.71	antimony 51 Sb 121.76	tellurium 52 Te 127.60	iodine 53 I 126.90	xenon 54 Xe 131.29						
cesium 55 Cs 132.91	barium 56 Ba 137.33	* 57-70	lanthanum 57 La 138.91	hafnium 72 Hf 178.49	tantalum 73 Ta 180.95	tungsten 74 W 183.84	reuterium 75 Re 186.21	osmium 76 Os 190.23	iridium 77 Ir 192.22	platinum 78 Pt 195.08	gold 79 Au 196.97	mercury 80 Hg 200.59	thallium 81 Tl 204.38	lead 82 Pb 207.2	bismuth 83 Bi 208.98	polonium 84 Po [209]	astatine 85 At [210]	radon 86 Rn [222]					
francium 87 Fr [223]	radium 88 Ra [226]	* *	actinium 89 Ac [227]	rutherfordium 103 Rf [261]	dubnium 104 Db [262]	seaborgium 106 Sg [266]	bohrium 107 Bh [264]	hassium 108 Hs [269]	meitnerium 109 Mt [268]	unnilium 110 Uun [271]	ununium 111 Uuu [272]	ununbium 112 Uub [273]	ununquadium 114 Uuq [289]										
* Lanthanide series		lanthanum 57 La 138.91	cerium 58 Ce 140.12	praseodymium 59 Pr 140.91	neodymium 60 Nd 144.24	promethium 61 Pm [145]	samarium 62 Sm 150.36	europium 63 Eu 151.96	gadolinium 64 Gd 157.25	terbium 65 Tb 158.93	dysprosium 66 Dy 162.50	holmium 67 Ho 164.93	erbium 68 Er 167.26	thulium 69 Tm 168.93	ytterbium 70 Yb 173.04								
** Actinide series		actinium 89 Ac [227]	thorium 90 Th 232.04	protactinium 91 Pa 231.04	uranium 92 U 238.03	neptunium 93 Np [237]	plutonium 94 Pu [244]	americium 95 Am [243]	curium 96 Cm [247]	berkelium 97 Bk [247]	californium 98 Cf [251]	einsteinium 99 Es [252]	fermium 100 Fm [257]	mendelevium 101 Md [258]	nobelium 102 No [259]								

Figure 4.21. [The Periodic Table](#)

Heavier nuclei need more neutrons to be stable until in Uranium proton repulsion overwhelms the quark links and the nucleus breaks apart in nuclear radiation (Figure 4.22). Shell models don't explain why some nuclei aren't spherical, and a simple "bowl of fruit" model isn't very useful.

If protons and neutrons are quarks sharing photons in a closed triangle, they could open up to recombine in longer quark strings if the same rules are satisfied: namely a closed shape with the internal angles of an equilateral triangle. Higher nuclei as quark strings would be bound as protons and neutrons are, by photon sharing. Each link

must bend the string 60° but a quark can rotate to make the connection, so nuclei can build up into 3D shapes that fold in space as proteins do<sup>41</sup>. Photon sharing needs proximity, so neutrons are needed as string buffers to stop same-charge protons getting too close to each other. Folding quark strings will be compact but not exact spheres, as observed, and larger nuclei will need more neutrons to fill fold-back loci that make protons adjacent. Hydrogen can add a second neutron to become Deuterium, the hydrogen of heavy water, but such isotopes<sup>42</sup> may be unstable because quark strings need the tension of proton repulsion to fold.

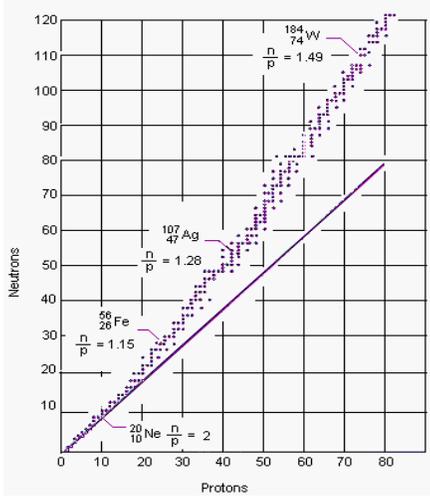


Figure 4.22 [Nuclear neutrons by protons](#)

wave there. The waviness of quantum particles is managed by *Pauli's exclusion rule*, that entities can overlap like waves if they have different quantum numbers – that we devise after the fact, e.g. in the shell model, electrons co-exist in an orbit by quantum numbers we set, that aren't based on, or even compatible with, any other physical laws.

If electrons orbited atomic nuclei as planets orbit the sun they would occasionally collide, but they *never do*. A lead atom with 82 electrons whizzing around in close proximity is stable for billions of years, so how do all those electrons never meet? And a mass in orbit is accelerating, so it should lose energy and spiral inwards, but electrons don't do this. Are the laws of physics for electrons different in atoms? If not, do they orbit slower than light and by how much? Or if they have light speed orbits why don't they move that fast in space? Current theory handles this by letting a cloud of virtual photons shield electrons from the nuclear attraction and the repulsion of other electrons, i.e. invisible causes make it so!

Table 4.7. Particle shell and sub-shell predictions

Shell	Sub-shell						No
	s	p	d	f	g	h	
1	1s=2						2
2	2s=2	2p=6					8
3	3s=2	3p=6	3d=10				18
4	4s=2	4p=6	4d=10	4f=14			32
5	5s=2	5p=6	5d=10	5f=14	5g=18		50
6	6s=2	6p=6	6d=10	6f=14	6g=18	6h=22	72

chemical properties, e.g. elements ending a row like Neon are *inert* because their *full electron shells* don't give or take

This *nuclear evolution*<sup>43</sup> may make certain nuclei more stable:

“Nuclei with either protons or neutron equal to certain “magic” numbers (2, 8, 20, 28, 50, 82, 126) are particularly stable.” (Marburger, 2011) p253

If periodic table nuclei are folding quark strings, nuclei with a magic number of nucleons may be more stable because they form the symmetric shapes that gave rise to magic numbers in the first place.

#### 4.6.2. Electrons in orbit

In current physics, an electron is a particle in space but a wave in an atom, by the miracle of wave-particle duality. Everyone knows a particle isn't a wave and a wave isn't a particle, but this miracle lets physics choose the equations that work<sup>44</sup> so no-one questions how *the electron knows* to be a particle here and a

wave there. The waviness of quantum particles is managed by *Pauli's exclusion rule*, that entities can overlap like waves if they have different quantum numbers – that we devise after the fact, e.g. in the shell model, electrons co-exist in an orbit by quantum numbers we set, that aren't based on, or even compatible with, any other physical laws.

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In this model, an electron is only one-dimensional matter so is like light on the other two. In three dimensional space, it moves like light on two dimensions but is like matter on one, so on average moves slower than light. However in a two-dimensional orbit it can be entirely like light, i.e. a wave. A particle circling a center needs an agent to stop it falling in, but wave can pulse forever IF the orbit circumference matches its wavelength. It can't spiral in because its wavelength implies a minimum orbit (see next section).

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#### 4.6.3. Electron shells

The electrons of a periodic table element define its chemical properties, e.g. elements ending a row like Neon are *inert* because their *full electron shells* don't give or take

<sup>41</sup> See [https://en.wikipedia.org/wiki/Protein\\_folding](https://en.wikipedia.org/wiki/Protein_folding)

<sup>42</sup> Isotopes of an element have the same number of protons but a different number of neutrons.

<sup>43</sup> Nuclear bombs split atoms apart in *nuclear fission* but stars radiate by the *nuclear fusion* of hydrogen atoms into helium.

<sup>44</sup> Wave-particle duality lets physicists choose one set of equations for electrons in orbits, and another for electrons in space.

electrons from others. In contrast other atoms have to exchange electrons to complete shells, i.e. chemically bond as atoms with extra electrons donate them to those with a deficit to complete all the shells in a stable molecule.

The current electron shell description involves two quantum numbers:

1. *Shell number n* (: 1, 2, 3 ...), began as the orbit radius.
2. *Sub-shell number l* (s, p, d ...), no clear meaning.

The s, p, d sub-shells were deduced from spectroscopic data analysis to contain 2, 6 and 10 electrons, and electrons fill shells and sub-shells according to the quantum numbers we allocate. In the initial simple model, inner orbits with fewer electrons filled before bigger orbits with more electrons, and so the periodic table grew. Doubling the first orbit of two electrons quadrupled the area to allow eight electrons, tripling allowed eighteen, quadrupling it thirty two, and so on. Indeed Hydrogen and Helium are the first periodic row and the second row has eight elements Lithium-Neon, but the third row is still only eight elements, including the carbon and oxygen we need to live, and the expected eighteen elements only occur in the next row. The predicted periodic table rows of 2, 8, 18, 32, 50 and 72 (Table 4.7) were instead 2, 8, 8, 18, 18, 32 and 32. So in the by now established practice, we tweaked the quantum numbers so the *sub-shells* fill in this odd order:

- |                   |                                       |
|-------------------|---------------------------------------|
| 1. 1s             | Hydrogen-Helium (two elements)        |
| 2. 2s, 2p         | Lithium-Neon (eight elements)         |
| 3. 3s, 3p         | Sodium-Argon (eight elements)         |
| 4. 4s, 3d, 4p     | Potassium-Krypton (eighteen elements) |
| 5. 5s, 4d, 5p     | Rubidium-Xenon (eighteen elements)    |
| 6. 6s, 4f, 5d, 6p | Cesium-Radon (thirty two elements)    |
| 7. 7s, 5f, 6d, 7p | Francium-? (thirty two elements)      |

So the third shell fills with one of its sub-shells empty and generations of chemistry students have had to learn that Argon completes the third shell without the 3d sub-shell, even though that denies what a sub-shell *means*. If they asked why, the answer was *because it does!* In contrast, this model is based on electrons as bipolar waves with these properties:

1. A wave self-destructs if its orbit circumference isn't a wave harmonic.
2. Waves at right angles don't interfere, like light at right angles.
3. Every wave has a minimum orbit, which for a bipolar wave is a half its wavelength.

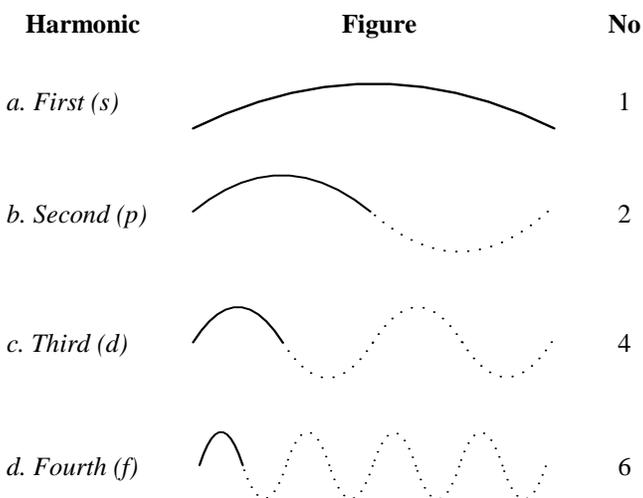


Figure 4.23. Bipolar wave harmonics for an orbit

second periodic table row of Lithium to Neon.

This model explains the periodic table as follows:

1. *The first shell* has a half wavelength circumference, where a bipolar wave going up and down on alternate cycles is the *1s sub-shell*, or *first harmonic* sub-shell (Figure 4.23a). An orbit sphere allows two such waves at right angles that literally don't exist to each other, so the first shell has two electrons and ends with the inert gas Helium. Higher shells arise as electron waves occupy orbits that are multiples of this basic circumference.

2. *The second shell* has a one wavelength circumference. The first harmonic is again an electron alternating up and down at this wavelength and another at right angles gives the 2s sub-shell two electrons. The *second harmonic* (Figure 4.23b) lets two electrons fill one circumference, which for two axes is four in total. The [extra harmonics](#) of two-dimensional waves like on a drum surface allow two more electrons, so six in total for the 2p sub-shell gives the second shell eight electrons and the

3. *The third shell* has a one and a half wavelength circumference, tripling the first radius. This again gives 3s and 3p sub-shells but the next harmonic can't occur. A bipolar (up-down) wave can vibrate once on a string half its wavelength and twice on a string of the same wavelength, but it can't do any more on a string one and a half times that, as the result self-destructs. Adding half a wavelength adds no new harmonics so the third shell, like the second, has only eight electrons, i.e. *a harmonic wave model has no 3d subshell*.

4. *The fourth shell* has a two wavelength circumference. Four times the first radius allows a new harmonic that allows four electrons per circumference, which for two axes is eight, plus two complex harmonics is ten (Figure 4.23c). This plus the first (4s), second (4p), and complex harmonics gives the eighteen elements of the periodic table fourth row.

5. *The fifth shell*, like the third, allows no new harmonic, so its 5s, 5p and 5d subshells repeat the previous total of eighteen, giving the periodic table fifth row.

6. *The sixth shell* allows a new harmonic with six electrons per axis (Figure 4.23d), which doubled again is twelve, plus two complex harmonics is fourteen. This plus eighteen from the s, p and d harmonics gives the thirty two elements of the sixth periodic table row<sup>45</sup>, and the seventh orbit is also restricted to 32 elements.

An electron wave model then fills the periodic table as follows:

- |                   |                                       |
|-------------------|---------------------------------------|
| 1. 1s             | Hydrogen-Helium (two elements)        |
| 2. 2s, 2p         | Lithium-Neon (eight elements)         |
| 3. 3s, 3p         | Sodium-Argon (eight elements)         |
| 4. 4s, 4p, 4d     | Potassium-Krypton (eighteen elements) |
| 5. 5s, 5p, 5d     | Rubidium-Xenon (eighteen elements)    |
| 6. 6s, 6p, 6d, 6f | Cesium-Radon (thirty two elements)    |
| 7. 7s, 7p, 7d, 7f | Francium-? (thirty two elements)      |

Electrons now fill shells and sub-shells in strict order, with no strange jumping between them, based on:

1. *Shell circumference*. A wavelength circumference of 1, 2, 3, 4...
2. *Subshell harmonic*. Orbit circumference/wavelength, where s=1/2, p=1, d=2, etc.
3. *Magnetic moment*. The great circle axis orientation.

Electrons fill in the order they do based on:

1. *Shell order*. Each shell is a greater circumference. If an electron were pure light a longer wavelength would be less energy, but it has mass so larger orbits require more processing, i.e. more energy. Shells fill in the order 1, 2, 3... because smaller orbits need less processing.
2. *Subshell harmonic*. Each subshell harmonic is a shorter wavelength for the same orbit circumference, so it involves more energy. Subshells fill in the order s, p, d... because lower harmonics need less processing

If electron sub-shells are wave harmonics, electrons fill the periodic table as it is, with no tweaks needed.

## 4.7. OTHER ISSUES

A processing model suggests answers to problems that have plagued physics for some time.

### 4.7.1. Charge neutrality

As our galaxy is largely charge neutral, physicists generally suppose the universe as a whole is the same and probably was from the start, but if charge is an inherent property why did the big bang dole out equal amounts of it? The current answer, that this neutrality was set arbitrarily at the creation, is unsatisfactory.

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<sup>45</sup> If the first shell has circumference C, the sixth shell has circumference 6C, with subshell harmonic wavelengths: 6s ( $\lambda=12C$ ), 6p ( $\lambda=6C$ ), 6d ( $\lambda=3C$ ) and 6f ( $\lambda=1C$ ).

In this model, matter didn't arise like Venus from the sea complete and perfect, but evolved as life did. Quantum events repeat at a fantastic rate, so anything not 100% stable reconfigures sooner or later. *Every* option is tried until one "sticks", i.e. doesn't change. This is how electrons, neutrinos and quarks survived the initial chaos, and the first atom was born because a proton plus an electron is more stable than either alone. So the universe is electrically neutral because charge comes from matter that is largely made of stable atoms that are charge neutral. It was by evolution, not by fiat.

#### 4.7.2. Matter "half spins"

If you accept the standard model, an electron is a dimensionless point of no extent so it can't spin. So physicists have given up trying to understand quantum spin (let alone how matter *half-spins*):

*"We simply have to give up the idea that we can model an electron's structure at all. How can something with no size have mass? How can something with no structure have spin?" (Oerter, 2006) p95*

In contrast in this model, a photon occupies a quantum dimension orthogonal to its polarization plane, so an electron as many photons *really can spin*. Note that a fourth dimension<sup>46</sup> adds *three new quantum directions* at any point, all at right angles to both our space and each other<sup>47</sup> (Figure 4.24). A photon is a two dimensional structure in a four dimensional quantum space, so like paper sheet it is invisible when viewed edge-on. Horizontal filters stop horizontal but not vertically polarized light because photons polarized at right angles occupy different spaces, and so don't exist to each other. So if an electron is photons filling the channels of an axis, for any line of view only half of them are visible. If one photon is 100% visible another at right angles will be 0%, for 99% there is a 1%, and so on. If only half an electron's photons register with us, we can only measure half its spin, and so say it *half spins*.

Turning an object 360 degrees in our space returns its original state but turning an electron 360 degrees only half-turns it - it takes 720 degrees of turning to return an electron to its original state. This is impossible in three dimensions but an electron in four has two planes to turn into not one. Turning in one dimension only turns half its photons - another turn is needed to turn the other half. We forget that we are the Flatlanders (Abbott, 1884) in a four-dimensional quantum reality.

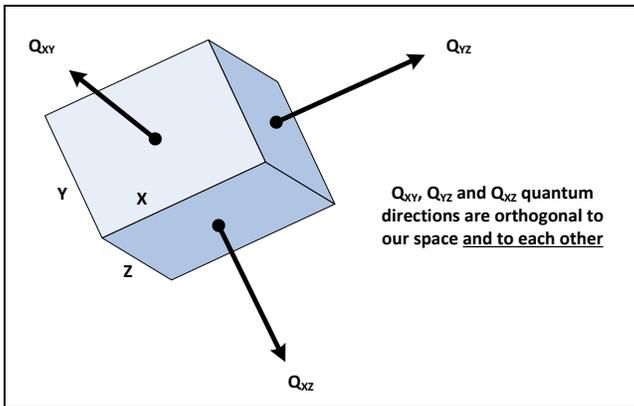


Figure 4.24. Quantum directions

#### 4.7.3. Neutrino asymmetry

If the laws of physics varied with position, each new view would need new rules, but fortunately the view changes the values but not the equation. Spatial symmetry is basic to physics itself, but neutrinos *always* have left-handed spin, an asymmetry that is reflected neither in the world we see nor the laws that describe it. As Pauli said:

*"I cannot believe God is a weak left hander"* (Lederman & Teresi, 2012) (p. 256)

What is handedness? If you point your left thumb forward, the curled fingers of that hand are left-handed spin, and if you point your right thumb forward, the fingers are right-handed spin. As your hands move forward, the two spins are always different, but while electrons spin either way, *all* neutrinos are left-handed and *all* anti-neutrinos are right-handed. By spatial symmetry an entity and its mirror image should be the same, and an electron inverted in a mirror is an electron, but a neutrino in a mirror is an anti-neutrino. Why this is so, the standard model can't explain.

As the first photon had to move up or down on space to make matter or anti-matter, so it had to spin left or right with respect to its movement direction, and it went left. Yet spin should change with direction as reversing a photon's direction reverses its spin. So even if every electron spun left initially, after bouncing off many things they should now spin both ways, and indeed they do. One might expect the same for neutrinos, but neutrino mass comes from *one* of the two photon

<sup>46</sup> For a photon moving in direction X, its quantum amplitude A vibrates in plane AX. The structure AX can then spin.

<sup>47</sup> The orthogonal directions X, Y, Z of space give three orthogonal planes XY, YZ and XZ. A fourth dimension A adds three more orthogonal planes A<sub>1</sub>X, A<sub>2</sub>Y, A<sub>2</sub>Z, where A<sub>1</sub>, A<sub>2</sub> and A<sub>3</sub> are at right angles.

sets colliding, that both spin left with respect to their direction. A neutrino reversing direction changes phase, *so the left spinning photons going the other way now create its mass*. When electrons reverse direction their mass origin doesn't change, but when neutrinos change direction the *other* colliding photons create their mass, and they always spin left.

Since anti-clockwise processing always spins right, for our universe anyway, anti-neutrinos have right handed spin for the same reason. Neutrinos spin left and anti-neutrinos spin right because when they reverse direction the source of their tiny mass changes. A processing model can explain why neutrinos *always* spin left and anti-neutrinos *always* spin right.

#### 4.7.4. The matter problem

A proton's charge is one, the simple sum of the charges of its quark constituents, but its mass is a hundred times that of three quarks. When quarks combine their charges just add, but for some reason their masses compound:

*"... though the actual value of the basic electric charge ... remains a theoretical mystery ... all other charges found in the universe are ... multiples of this value. Nothing like this appears to be the case for rest-mass, and the underlying reason for the particular values of the rest-masses of ... particle types is completely unknown."* (Penrose, 2010) p153.

Current physics attributes this extra mass to virtual gluons binding the quarks, but how do *massless* gluons make all that extra mass? And if they do, why don't they make extra charge too?

In this model, charge as left-over processing is limited to one Planck program per channel so why isn't mass, the net processing done, limited? In decentralized networks, when programs seek access to the same resource at the same time they *interfere* so at least one must retry, and a retry wastes processing that in this case *is mass*. When three quarks in a triangle form a proton the channels overlap, so photons compete for channels, i.e. interfere. A server can only satisfy one request at a time, so the other request must retry, increasing the processing and hence the mass.

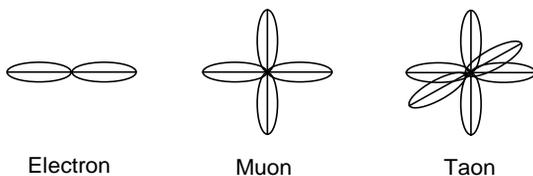
Interference could explain why a down quark is heavier than an up quark. In this model, an up quark is two sets of photon tail colliding with one set of photon heads (Table 4.3), where the two tails access channels first, leaving the heads with the remaining channels. In a down quark, one tail set gets first access, leaving two sets of photon heads to fight over the rest, giving more interference and more mass. The masses the standard model just *allocates* could *be derived* from photon simulations, i.e. we could *discover* why down quarks are heavier than up quarks by simulating them.

#### 4.7.5. Family generations

Electrons, quarks and neutrinos have family generations, each like the last but heavier, e.g. an electron has a *muon* elder brother of the same charge and spin but two hundred times heavier and a *tau* eldest brother three and a half thousand times heavier! Up and down quarks have heavier *charm* and *strange* quark older brothers, and *top* and *bottom* quark eldest brothers but again after three generations no more. If these particles are the building blocks of the universe, they are like a Lego set with one brick 75,000 times bigger than another, as a top quark is 75,000 times heavier than an up quark! The standard model *describes* family generations, but it doesn't say:

1. Why do family generations occur?
2. Why three generations, then no more?
3. Why are the higher generations *so heavy*?

Family generations are natural to this model, as if an electron fills the channels of *one* axis, a muon could do the same on *two* axes and a taon on *three* (Figure 4.25). All are still point entities, and no more generations can occur in a space of



three dimensions. Each is heavier than before because overlapping channels *interfere* increasing the processing that is mass. Taons are *so heavy* because interference cumulates as one traffic obstruction can cause another. If a muon is an electron collision doubled, why doesn't it have a minus two charge? It does, but we can only measure charge one axis at a time, and after each measurement the system resets. On any one axis, a muon's charge is minus one.

Figure 4.25. Electron generations as dimension repeats

To dimensionally repeat a quark structure three times needs more bandwidth than a node allows, so quark generations aren't simple duplicates. Yet the tail-tail-head planar *triangle* of an up quark could form a charm quark *pyramid* whose every

side presents an up quark's charge but with more mass by interference. A tail-head-head down quark could likewise form a strange quark pyramid. Top and bottom quarks then fill a node with two up and down quark planes at right angles, with more mass again by interference. The mysterious family generations of the standard model arise from the dimensions of space and their high masses from processing interference.

#### 4.7.6. Dark energy and dark matter

Unlike the Higgs which is a purely theoretical concept, dark matter and dark energy refer to actual effects. Dark matter is the force that binds galaxies together and dark energy is what stops gravity from collapsing the universe. The standard model focuses on the matter we see, but cosmology shows that there is five times more *dark matter* than matter, so began a costly search for WIMPs<sup>48</sup> that like that for gravitons and squarks was fruitless, despite talk of super-WIMPs (Feng, Rajaraman, & Takayama, 2003). Since 70% of the universe is *dark energy* the standard model can't explain either, even with the Higgs, what only explains only 5% of the universe isn't even close to being a theory of everything.

*Dark energy* is a negative gravity that pushes the universe apart, to accelerate its expansion, unlike gravity that pulls it together. It is a weak effect, spread evenly through space that hasn't changed much over time. In equations. it makes space flat, so some call it a property of space itself, but a property of space should increase as space expands, and any "thing" floating in an expanding space should weaken over time. Currently, no-one has any idea what it is.

In this model, our three-dimensional space is the inner surface of a four-dimensional hyper-bubble that *adds new nodes* as it expands. So new points of space are being added all the time, and for their first cycle new nodes receive but don't transmit, giving the negative energy effect we call dark energy. If new space adds at a constant rate the effect will be constant, and that dark energy arises from new space means that no physical cause can explain it. So our universe loses energy as expanding gas does, and energy isn't conserved for the universe overall.

*Dark matter* presents as a halo around the black hole at a galactic center that holds its stars together more tightly than their gravity allows. It isn't the matter we see because no light can detect it, it isn't anti-matter because it has no gamma ray signature and it isn't a black hole because there is no gravitational lensing, but without it the stars of our galaxy would fly apart. Dark matter binds our galaxy together, but no one knows how.

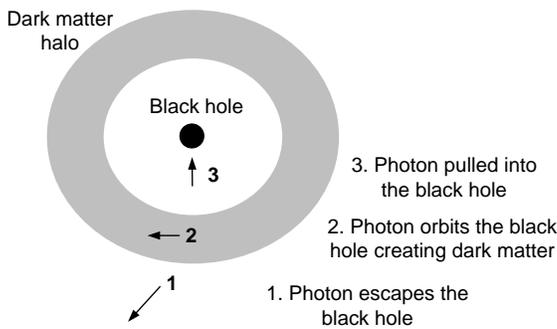


Figure 4.26. Dark matter is light in orbit

Normal and dark matter are in processing terms the same, but the latter is spread over a vast halo while the former is confined to a node.

#### 4.7.7. Mesons as matter/anti-matter hybrids

Electrons annihilate anti-electrons in a blaze of energy but quarks and anti-quarks quietly form semi-stable mesons like the pion (Annex B). Particle physics gives each meson a Greek letter name, but is a *Kaon* that exists for a million, million, millionth of a second really a *thing*? Flashes of lightning live longer and we don't reify them. Yet pions are relatively long lived, raising the question "Why are pions so stable?"

<sup>48</sup> WIMPs are Weakly Interacting Massive Particles.

<sup>49</sup> MoND stands for Modified Newtonian Dynamics, see [here](#).

In this model, a proton is when three quarks share photons, each linking its free axis to the neutral axis of another in a triangle. Two quarks doing this leaves one of them unstable, but if two can join their free photon axes to give a meson, why are only *different quark/anti-quark pairs*<sup>50</sup>, or pions, stable? In this model, to share photons quarks must:

1. *Create mass.* Strong links require mass so the net processing must not cancel.
2. *Be adjacent.* The free axes must align and be adjacent,

A strong link requires mass, so quark/quark pairs that share photons to give no net mass cant strongly link, but *quark/anti-quark* pairs can. And the opposite charge axes of up/anti-up and down/anti-down pairs attract to stop the free axes closing to link, but for *different* mixes the charge axes repel letting the free axes link. Pions as *different quark/anti-quark* mixes both create the mass needed to strongly link and can align their free axes. The result is incomplete, but four outward facing full axes shield the deficiency.

The standard model calls an up/anti-down quark mix a pion *particle* and a down/anti-up mix an *anti-particle*, but if both are matter/anti-matter mixes, the particle/anti-particle idea is an anachronism. Matter photons spin one way and anti-matter photons the other, so mesons have no spin because their photons cancel, not because they don't spin. The standard model calls mesons bosons with mass and charge, but none of them carries a field force. In quantum realism, mesons are matter/anti-matter hybrids not bosons.

#### 4.8. SEEING THE WORLD IN A NEW WAY

Physical realism<sup>51</sup> sees a world of *real particles* that self-exist in an absolute space-time plus *virtual particles* that give effects like magnetism. *Particles rule*, but as accelerators smash matter into bits *virtual particles* are ruling more:

*“The Higgs mechanism is often said to account for the origins of mass in the visible universe. This statement, however, is incorrect. The mass of quarks accounts for only 2 percent of the mass of the proton and the neutron, respectively. The other 98 percent, we think, arises largely from the actions of gluons. But how gluons help to generate proton and neutron mass is not evident, because they themselves are massless.”* (Ent, Ulrich, & Venugopalan, 2015)

Most of an atom's mass comes from its nuclear protons and neutrons, so if virtual gluons make up most of their mass, the physical world consists mainly of virtual particles! It is ironic that this new fairytale physics (Baggot, 2013) is being used to justify a mechanistic universe, that has:

1. *No plan.* Inert matter created galaxies, stars, planets, life and us by accident with no design or plan. If something made our universe, it long ago abandoned it to the random interaction of particles.
2. *No choice.* The laws of physics control everything from people to galaxies, so human choice is just a brain illusion and consciousness is an epiphenomenon of system complexity (Zizzi, 2003), i.e. there is no choice really.
3. *No future.* The laws of thermodynamics doom everything to run down, whether our bodies, the sun or the universe. What began in a big bang must end in a “big freeze”, an infinite future of eternal nothingness.

This *cosmic nihilism*, like other nihilisms before, is leading nowhere. It calls itself the voice of reason, but reason tells us that a universe that had a beginning had to come from something else, that quantum randomness implies a non-physical choice and that a universe that is always decaying must have begun ordered, which ours didn't. The myth of a world *going nowhere that accidentally made us* makes no more sense than that of a world *built for us by a supreme being*.

Physical realism is *just a theory* and scientists who don't question their theories are priests. Last century it was the only game in the town, but quantum realism now suggests that: space is a processing *network*, a point is a processing *node*, time is processing *cycles*, a photon is the basic *program*, matter is light *entangled*, quantum states are *pixels* and the physical world consists of *reboot events*. If this is wrong, let the facts decide.

Table 4.8 compares a processing explanation of the facts of physics with the static particle view, e.g. did our universe pop out of space as a ready-made thing, like Venus rising perfect from the sea, or did it *boot up*<sup>52</sup>, i.e. begin small. as

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<sup>50</sup> Namely the up/anti-down and down/anti-up pions observed.

<sup>51</sup> Physical realism is the idea that only the physical world is real. See [What is Reality?](#) for a discussion.

<sup>52</sup> Based on the idea of “*pulling yourself up by your own bootstraps*”.

Windows boots from a tiny CMOS that loads a *kernel* that loads a bigger *BIOS*<sup>53</sup> that loads the full *operating system*. Booting up a computer isn't booting up a universe, but it could be the same on a vast scale if one photon spawned the first light that merged into matter, life and eventually us. This view has no divine shortcuts, as every element had to be *built*, in the matter factories we call stars or in a supernova sacrifice. As said long ago, nothing can come from nothing<sup>54</sup>, so light had to create matter, matter had to create life and life had to create sentience, i.e. species like us. Darwin discovered *biological evolution*, but long before that *physical evolution* was building biology.

Is there a plan? If our world followed a pre-set route to a best end-state we would be pointless cogs in a big machine, powerless to change the divine plan. The universe isn't like this, so some see no plan, choice or future, but the corollary *that nothing really matters at all* denies the accountability that societies need to work (Whitworth & Ahmad, 2013). If it were true, human society would collapse and we would not be here.

To expect a dynamic system to follow a static plan is naïve. Even a home heating system with a pre-set temperature doesn't need a fixed plan or external control. A universe *structured to evolve* doesn't have to be told what it can discover. Nor does evolution need our approval, as myriads of creatures have been borne, struggled and died not knowing their role in an evolution that we know occurred. Evolution only needs its own conditions, e.g. quantum randomness seems pointless to us but is the physical equivalent of genetic variation in biology. If processing cycles create *change*, quantum randomness gives *variety* and stable end-states are *naturally selected*, physical evolution is inevitable. Some conclude from biological randomness that there is no design, but I argue from quantum randomness that *evolution is the design*.

In this view, every parameter needed to evolve was in place from the start, including the speed of light, Planck's constant, the electron charge, the size of space and the matter choice<sup>55</sup>. So if the quantum bulk did spawn other "bubble" universes, they would all have the same initial laws of physics, but the original symmetry might have broken the anti-matter way. A vision emerges of a cosmos that was from the beginning:

1. *Evolving*. Our universe wasn't built as a watchmaker builds a watch to a fixed plan, but like a baby not knowing where it is going or why. Evolution, like justice, is blind, but a universe that went from light to matter to life and sentience isn't going nowhere. The ability to evolve was built in.
2. *Choosing*. Information by definition needs a choice situation (Shannon & Weaver, 1949) so a virtual world based upon it needs choice. *Choice* makes the future unknown, so the system *can't* know where it is going in advance. In our universe even electrons make choices that nothing outside can define, so choice was also built in.
3. *Observing*. That which chooses and evolves follows the Star Trek directive: *To boldly go where none have gone before*, but that needs what is even more fundamental: *an observer*. A virtual reality can create things, space and time, but an observing *consciousness*, the information *sink* or *source*, must be given from the start.

A causal chain links each of us to the first mother<sup>56</sup>, the first animal, the first cell, the first atom and the first light. So how can we separate our species from its origin, to say only we are conscious. Logic says that if we are conscious then so is everything else (Conway & Koch, 2006). In quantum realism, even an electron is conscious, as it "observes" the virtual reality in its own way. We differ from other species in self-awareness, not consciousness (Whitworth, 2009).

Homo-sapiens was the lucky ape that won the evolutionary lottery, but that on all the planets in all the galaxies some species did this was inevitable. Evolution is random but not uncertain. Even if we are the first sentient beings, which is unlikely, we won't be the last, because what is possible will happen again, by the law of all action. As an *experiment of consciousness*, if we don't work something else will replace us, yet by our ancestor's struggles we have a *right to be here*.

One can make an inherent *thing* and walk away but a virtual object must be *sustained*, as a screen image must be refreshed to exist. So if our world is a virtual joke, it is an expensive one. It beggars belief that the investment needed to

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<sup>53</sup> BIOS stands for **B**asic **I**nput **O**utput **S**ystem.

<sup>54</sup> In Latin, *Nihil fit ex nihilo*, attributed to Parmenides.

<sup>55</sup> The speed of light in a vacuum is the default grid cycle rate, Planck's constant is a Planck program transfer, an electron charge is a one Planck set processing remainder, the size of space is the network density and anti-matter is anti-processing.

<sup>56</sup> Mitochondrial DNA evidence suggests that all humans today came from one mother who survived the trek out of Africa.

create and sustain a simulation as large as our universe for fourteen billion years was for no reason. If our universe is a virtual reality, it has a purpose whether we are aware of it or not.

Table 4.8. Particle and processing explanations of matter

Physical realism	Quantum realism
<p><i>Matter.</i> Is made of <i>fundamental particles</i>, where:</p> <ul style="list-style-type: none"> <li>a) <i>Mass.</i> Is an inherent property, for some reason</li> <li>b) <i>Charge.</i> Is an unrelated other property, for some reason</li> <li>c) <i>Space.</i> Isn't a particle, so it is nothing</li> <li>d) <i>A photon.</i> Is a "particle" with no mass or charge</li> <li>e) <i>Anti-matter</i> exists for some reason</li> </ul>	<p><i>Matter.</i> Is a processing <i>standing wave</i>, where:</p> <ul style="list-style-type: none"> <li>a) <i>Mass.</i> Is any processing demand that repeats</li> <li>b) <i>Charge.</i> Is any processing remainder that repeats</li> <li>c) <i>Space.</i> Is a Planck program in one node</li> <li>d) <i>Photon.</i> Is the same program in many nodes</li> <li>e) <i>Anti-matter.</i> Is the processing of matter in reverse</li> </ul>
<p><i>Electron.</i> Is a fundamental point particle that has:</p> <ul style="list-style-type: none"> <li>a) No structure at all, as it is dimensionless</li> <li>b) An absolute mass, for every dimension</li> <li>c) A negative charge, because it does</li> <li>d) An imaginary spin, half the usual for some reason</li> <li>e) Is always on the move like light, but slower than light for some reason</li> <li>f) Doesn't collide in an atom orbit, for some reason</li> </ul>	<p><i>Electron.</i> A one-axis, <i>head-head</i> photon collision that has:</p> <ul style="list-style-type: none"> <li>a) A one dimensional collision structure</li> <li>b) Mass in one-dimension only</li> <li>c) Negative charge by the negative processing left over</li> <li>d) Half spin as only half its photons show for any axis</li> <li>e) Moves like light on two dimensions but the matter axis slows it down</li> <li>f) Moves like light in a two dimensional orbit</li> </ul>
<p><i>Neutrino.</i> A fundamental point particle of tiny mass with:</p> <ul style="list-style-type: none"> <li>a) No structure at all</li> <li>b) A tiny mass that varies, for no known reason</li> <li>c) Zero charge, for some reason</li> <li>d) Electron-like properties, for some reason</li> <li>e) Left-handed spin, for no known reason</li> </ul>	<p><i>Neutrino.</i> A one node <i>head-tail</i> photon collision with:</p> <ul style="list-style-type: none"> <li>a) The channels of one axis are permanently locked</li> <li>b) Processing that doesn't quite cancel by asynchrony</li> <li>c) The processing remainder cancels to no charge</li> <li>d) Electron-like because it is also a one-axis entity</li> <li>e) Left-handed spin because reversing swaps its mass</li> </ul>
<p><i>Quark.</i> A fundamental point particle that:</p> <ul style="list-style-type: none"> <li>a) Has no structure at all</li> <li>b) Has up and down versions, for some reason</li> <li>c) Is never found alone, for some reason</li> <li>d) Has unexpected one-third charges</li> <li>e) Binds to other quarks by a new strong force</li> </ul>	<p><i>Quark.</i> A one node three-axis photon collision that:</p> <ul style="list-style-type: none"> <li>a) Has a charge, neutral and free axis structure</li> <li>b) Can be <i>head-tail-tail</i> (up) or <i>head-head-tail</i> (down)</li> <li>c) Doesn't fill a plane's channels so isn't stable alone</li> <li>d) Has expected one-third processing remainders</li> <li>e) Binds to other quarks by sharing its free photons</li> </ul>
<p><i>Strong force.</i> An invisible strong field:</p> <ul style="list-style-type: none"> <li>a) Generates virtual gluons with a color property</li> <li>b) Give quarks a red green or blue color <i>charge</i></li> <li>c) Quarks bind into a proton if the colors cancel to "clear"</li> <li>d) Massless gluons make the proton <i>much heavier</i></li> <li>e) Whose strong links somehow increase with distance</li> </ul>	<p><i>Strong force.</i> Sharing photons cause the strong force, so:</p> <ul style="list-style-type: none"> <li>a) Gluons don't exist at all</li> <li>b) A quark's "color" is its <i>orientation</i></li> <li>c) Quarks in a proton orientate to share photons</li> <li>d) Photon interference makes the proton much heavier</li> <li>e) Shared photons link more when "stretched"</li> </ul>
<p><i>Weak force.</i> An invisible field causes the weak force, that:</p> <ul style="list-style-type: none"> <li>a) Generate massive virtual particles called W bosons</li> <li>b) Makes a neutron a proton by turning a down quark up</li> <li>c) Needs a massive W boson to turn a neutron into a proton of about the same mass</li> <li>d) Protons in space <i>never</i> become neutrons for some reason</li> </ul>	<p><i>Weak force.</i> An neutrino hit causes the weak force, so:</p> <ul style="list-style-type: none"> <li>a) W bosons don't exist at all.</li> <li>b) Turning photon heads into tails converts a neutron</li> <li>c) A tiny neutrino can convert a neutron into a proton of about the same mass, i.e. net processing</li> <li>d) Only in stars can electrons turn protons into neutrons</li> </ul>

<p><i>Atoms. Electron particles orbit proton and neutron particles:</i></p> <ul style="list-style-type: none"> <li>a) Periodic table elements fill shells/subshells based on data-fitted quantum numbers that represent nothing</li> <li>b) Protons and neutrons cram into the atomic nucleus like a plum pudding mix, with no structure</li> <li>c) Higher nuclei need more neutrons for some reason</li> </ul>	<p><i>Atoms. Electron waves orbit a folded quark string:</i></p> <ul style="list-style-type: none"> <li>a) Electrons fill atomic shells based on radius, wave harmonics and great circle orientation</li> <li>b) Protons and neutrons form quark strings that fold back into closed triangle shapes</li> <li>c) Long quark strings need more neutron buffers to fold</li> </ul>
<p><i>The particle model. In this view:</i></p> <ul style="list-style-type: none"> <li>a) Our universe arose Lego-like from 5 fields, 16 charges, 14 bosons, 62 particles and 23 data-fitted parameters</li> <li>b) The dark energy and dark matter that cosmology says are over 95% of the universe must come from particles too</li> <li>c) Family generations exist for no known reason</li> <li>d) Fields create virtual bosons to cause effects</li> <li>e) The Higgs boson creates the W bosons that cause the weak force</li> <li>f) Mesons are bosons that mediate no field forces</li> </ul>	<p><i>The processing wave model. Is this view:</i></p> <ul style="list-style-type: none"> <li>a) Our universe arises from one fundamental program, one grid network and three data-fitted parameters<sup>57</sup></li> <li>b) Dark energy is from the ongoing creation of space, and <i>dark matter</i> is light in orbit round a black hole</li> <li>c) Family generations are dimensional repeats</li> <li>d) All the bosons of physics are imaginary agents</li> <li>e) The Higgs is an imaginary particle that explains another imaginary particle that explains an effect</li> <li>f) Mesons are matter/anti-matter hybrids</li> </ul>
<p><i>The physical world is decaying, accidental and inert</i></p>	<p><i>The quantum world is evolving, choosing and alive</i></p>

### DISCUSSION QUESTIONS

The following discussion questions are addressed in this chapter:

1. Why are electrons and neutrinos classified in the same lepton group?
2. Why do neutrinos have a tiny mass but no charge?
3. How do mass and charge relate?
4. What came first, matter or light?
5. Why is the universe made of matter instead of anti-matter?
6. If anti-particles can go backwards in time, can causality be reversed?
7. Why does quark binding increase with distance?
8. Why do quarks have one-third charges?
9. Why do atomic nuclei need neutrons?
10. Why aren't the "fundamental particles" of the standard model actually fundamental?
11. Why are neutrinos always left-handed?
12. What causes the strong force that links quarks in the nucleus of an atom?
13. What do the "colors" of the standard model represent?
14. What causes neutrons in space to turn into protons?
15. Why don't protons decay like neutrons?
16. Why was the Higgs field needed? Does it explain mass? What did CERN probably find?
17. How is the standard model of physics like the standard model of medieval astronomy?
18. Why don't electrons in atoms collide with each other?
19. How do electrons occupy an atomic orbit?
20. Why do leptons and quarks have three family generations, then no more?
21. Why are the higher generation particles so heavy?

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<sup>57</sup> The network refresh rate represented by the speed of light, the network density represented by Planck's constant and the basic program represented by the mass or charge of one electron. From these, a simulation could derive all the other parameters.

22. How can point-particles without structure or extent spin? How do electrons half spin?
23. Why do mesons have no spin? Can a point entity have no spin? Why are some mesons their own anti-particles?
24. How does a processing model classify quantum entities?
25. If biological evolution involves a natural environment, genetic variety and species options, what are the equivalents for physical evolution?
26. Is there a quantum world? If so, what does this imply about reality?

## ACKNOWLEDGEMENTS

Thanks to Matthew Raspanti, Ben Iscatus, Gunnar Jörgen Viggósson, Kevin Player and Belinda Sibly for advice.

## ANNEX A: FAQ

1. *A universe as big as ours must be real.*

**Answer.** It is only “big” relative to our bodies within it.

2. *A universe that has been going for billions of years must be real.*

**Answer.** Again, only relative to us. With enough processing power, one could run a program of the history of the universe in a few seconds.

3. *It would take a computer bigger than the universe to simulate it.*

**Answer.** Physicists already speculate multiple universes, so if you accept a system bigger than our universe, why not one big enough to output it? In this model, a physical universe can be generated by a same size quantum universe because quantum processing is so powerful.

4. *So who is the programmer?*

**Answer.** I don’t know. I guess everything is.

5. *Computers need physical hardware so the argument is circular. Processing based on the physical world can't simulate the physical world. That's recursive.*

**Answer.** A physical world can't create itself, but a non-physical *quantum world* can create a virtual physical world. This is possible because processing is the changing of information that by definition is a choice from options (Shannon & Weaver, 1949), i.e. it isn't defined in physical terms so quantum processing doesn't need a physical base. There is no circularity.

6. *Can we hack into the system?*

**Answer.** Quantum computers already do that.

7. *Is this like The Matrix, with Keanu Reeves as Neo?*

**Answer.** No. Neo escaped from the Matrix into another *physical world*. In this theory, the physical world is the output of a *quantum world* that, according to quantum theory, doesn't behave like our physical world at all.

8. *This just defers the problem of fully explaining everything to another level, so it can't be a theory of everything (TOE).*

**Answer.** Quantum theory and general relativity dispelled the myth that science can explain everything last century. The TOE of an equation that explains everything was a mirage - a part can't explain the whole! The TOE idea is a dream but science as way to ask questions of our world is not. Quantum realism is a *query of everything* (QOE) not a TOE.

9. *If virtual reality calculations are performed by “something”, then it would be a system (like our Universe) that would need its own explanation, and we are back to square one, so to speak.*

**Answer.** The "something" you refer to is described by the advance of quantum theory, which did not leave us “back to square one” but one square further on. We need the humility to understand that there is no final solution.

10. *A theory that some other world creates this world is not testable.*

**Answer.** Of course it is. A theory about heaven is not testable but a theory about *this physical world* is. We can test if it is an information output because we know how the physical world behaves and we know how information behaves.

11. *It is all just meta-physics, like the number of angels on a pinhead.*

**Answer.** Meta-physics is untestable speculation on unknowable things, but the virtual reality conjecture targets *the world we see*, so it is not just meta-physics.

12. *This theory is unproven.*

**Answer.** So is the objective reality theory alternative. Would you fail one candidate by a test the other also fails? If science compares alternatives and picks the best, this theory explains more and assumes less.

13. *This theory is based on assumptions.*

**Answer.** So is every scientific theory. The method of science is to assume an hypothesis then test it by physical world data. Reverse engineering the physical world, by the method of design science, takes that approach.

14. *Denying the axiom that there is nothing outside the physical universe opens the floodgates to let anything convenient through, no matter how unlikely or even absurd.*

**Answer.** No floodgates open if we keep the scientific method of collecting data and making predictions. To ask a question about the physical world *is* science, even if it happens to be “*Is the physical world a processing output?*”

15. *This theory would end science, as you can't study what you can't by definition see.*

**Answer.** Not true. Science studies quarks no-one can ever see and it is still fine.

16. *A theory that postulates the unseen is not scientific.*

**Answer.** That science is about the seen is *logical positivism*, a simplistic nineteenth century view now discredited in almost every discipline. Physical visibility is not a demand of science, and never was, but physical testability is.

17. *This theory can never be decided.*

**Answer.** Not true. Science decides theories based on likelihood. It was able to decide whether our universe had a beginning, so it can decide whether or not it is a processing output.

18. *The theory contradicts Occam's razor.*

**Answer.** Occam's razor takes the simplest theory to fit the facts. Last century it favored an objective world but today space bends, time dilates and quantum entities teleport, so the razor cuts the other way. Compare the one grid network and one Planck program of this model with the five fields, thirty-eight basic particles, sixteen charges, fourteen bosons and twenty four result-fitted parameters of the standard model. Which is simpler?

19. *This is not mainstream physics.*

**Answer.** Of course it isn't. Nothing new ever is.

20. *This is a crazy idea.*

**Answer.** That doesn't make it untrue. Science advances by crazy ideas. Even if this theory is found to be wrong we might learn something. Some scientists have always been called crazy – that is what real science is about.

21. *This is just another God theory.*

**Answer.** No it isn't. God theories put no constraints upon God, but reverse engineering the physical world requires consistency. Everett postulated universes beyond ours so was he a God theorist? Just because a theory suggests there is a something beyond the physical universe we see doesn't make it a God theory.

22. *Who is the programmer? Is it God?*

**Answer.** Don't worry, whether the virtual reality conjecture is true or false we can continue to argue about God! It doesn't change that argument one way or another. Some say God is the programmer, some say advanced aliens and others even suggest ourselves from the future! In my view, every choice made alters the program, including ours.

23. *This model implies a phantom spirit world reality, alongside the physical world.*

**Answer.** No it doesn't. Dualistic religions imply a spiritual or heavenly world alongside the physical world we see, but quantum realism is a monism, i.e. it has just one reality, namely the quantum world, so it is the physical world that is the phantom reality. In the observer-observed interaction, it takes the observer as real not the observed.

24. *It isn't possible that everything we see is information!*

**Answer.** We already *know* that we see only information as neurons are on-off devices like transistors. Yet quantum realism isn't solipsism, that the universe is created by our minds. A dream doesn't exist without the dreamer, but this universe doesn't need humanity to dream it. It dreamed itself for billions of years before we came along, and so if we die out something else will take our place. Maybe rats will evolve an intellect.

25. *Where are the equations?*

**Answer.** They are already there in quantum theory, e.g. Schrödinger's equation describes a processing wave expanding in three-dimensions. Physics has enough equations already. Where is the meaning?

26. *Equations that work are enough. Physics doesn't need meaning.*

**Answer.** Physicists today mostly just calculate and only rarely stop to think what it means. Copenhagen enshrined this *carry on calculating* approach. If you like that then fine, but why stop others wondering what it means?

27. *I don't think the world is a fake.*

**Answer.** Neither do I. A virtual world is a *local reality* not a fake. It doesn't exist in or of itself, as an objective reality, but to those within it, it is as real as it gets. There is a real world "out there" generating our experiences - it just isn't the world you see. In quantum realism, the physical world is just your interface to the real world.

28. *If the physical world is virtual, we don't really exist!*

**Answer.** Yes and no. My physical body is virtual, like an avatar's pixels in a game, but the observing "I" in a virtual reality isn't pixels. The observer must be apart from the observed, and by Conway's free will theorem if we observe then so must every electron (Conway & Koch, 2006). Either reality is purely physical with nothing observing (physical realism) or it is purely quantum with everything observing (quantum realism). If *everything is observing*, we differ from animals and computers in *self-awareness* not in consciousness (Whitworth, 2009).

29. *Whoever is playing my character is pretty boring.*

**Answer.** Sorry about that. Have you tried all the options?

30. *This contradicts common sense.*

**Answer.** Common sense also told us that the earth was flat and the sun went round the earth.

31. *This is not a new idea.*

**Answer.** True. It goes back at least to Plato's prisoners in a cave, taking their shadows on the wall as reality. Modern precedents include Conrad Zuse, Edward Fredkin and Tom Campbell.

32. *Why would anyone create a world like this?*

**Answer.** We can only guess. Perhaps reality wanted to know itself and this was the only way?

33. *This theory makes no difference in practice.*

**Answer.** Yes it does. If matter comes from light, the money spent colliding protons should be spent colliding photons and the \$30 billion Higgs project just found another species in an already full particle zoo. How much money was spent looking for proton decay that doesn't happen, gravitons that don't exist, and WIMPs that will never be found?

34. *Is this the end of science?*

**Answer.** No. Science works just as well in a local reality as in an objective reality.

35. *Are paranormal powers like healing and precognition implied?*

**Answer.** They are not ruled out, but if you built a virtual world would you let the players flout the rules? I don't see too many holes in this system.

36. *Could the experiments at CERN start a new big bang? (Dunning, 2008)*

We affect physical outputs not the quantum rules behind them. Our universe arose in a once-only chain reaction, as the grid itself ripped apart to make all the free processing of our universe, which since then has been constant. For billions of years the system has experienced extremes beyond anything we know, and it still works. To think that our accelerators can harm the quantum world is like online Sims thinking they can hurt our world.

**ANNEX B. MESONS**

Particle	Symbol	Anti-particle	Makeup	Rest mass (MeV)	Life (secs)	Decay
<a href="#">Pion</a>	$\pi^+$	$\pi^-$	<u>u</u> <u>d</u>	139.6	$2.60 \times 10^{-8}$	$\mu^+ \nu_\mu$
<a href="#">Pion</a>	$\pi^0$	Self	1.	135.0	$0.83 \times 10^{-16}$	$2\gamma$
<a href="#">Kaon</a>	$K^+$	$K^-$	<u>u</u> <u>s</u>	493.7	$1.24 \times 10^{-8}$	$\mu^+ \nu_\mu, \pi^+ \pi^0$
<a href="#">Kaon</a>	$K_s^0$	$K_s^0$	1*	497.7	$0.89 \times 10^{-10}$	$\pi^+ \pi^-, 2\pi^0$
<a href="#">Kaon</a>	$K_L^0$	$K_L^0$	1*	497.7	$5.2 \times 10^{-8}$	$\pi^+ e^- \nu_e$
<a href="#">Eta</a>	$\eta^0$	Self	2.	548.8	$<10^{-18}$	$2\gamma, 3\mu$
<a href="#">Eta prime</a>	$\eta'^0$	Self	2.	958	...	$\pi^+ \pi^- \eta$
<a href="#">Rho</a>	$\rho^+$	$\rho^-$	<u>u</u> <u>d</u>	770	$0.4 \times 10^{-23}$	$\pi^+ \pi^0$
<a href="#">Rho</a>	$\rho^0$	Self	<u>u</u> <u>u</u> , <u>d</u> <u>d</u>	770	$0.4 \times 10^{-23}$	$\pi^+ \pi^-$
<a href="#">Omega</a>	$\omega^0$	Self	<u>u</u> <u>u</u> , <u>d</u> <u>d</u>	782	$0.8 \times 10^{-22}$	$\pi^+ \pi^- \pi^0$
<a href="#">Phi</a>	$\Phi$	Self	<u>s</u> <u>s</u>	1020	$20 \times 10^{-23}$	$K^+ K^-, K^0 \bar{K}^0$
<a href="#">D</a>	$D^+$	$D^-$	<u>c</u> <u>d</u>	1869.4	$10.6 \times 10^{-13}$	$K + \_ , e + \_$
<a href="#">D</a>	$D^0$	$\bar{D}^0$	<u>c</u> <u>u</u>	1864.6	$4.2 \times 10^{-13}$	$[K, \mu, e] + \_$
<a href="#">D</a>	$D_s^+$	$D_s^-$	<u>c</u> <u>s</u>	1969	$4.7 \times 10^{-13}$	$K + \_$
<a href="#">J/Psi</a>	$J/\psi$	Self	<u>c</u> <u>c</u>	3096.9	$0.8 \times 10^{-20}$	$e^+ e^-, \mu^+ \mu^- \dots$
<a href="#">B</a>	$B^-$	$B^+$	<u>b</u> <u>u</u>	5279	$1.5 \times 10^{-12}$	$D^0 + \_$
<a href="#">B</a>	$B^0$	$\bar{B}^0$	<u>d</u> <u>b</u>	5279	$1.5 \times 10^{-12}$	$D^0 + \_$
<a href="#">B<sub>s</sub></a>	$B_s^0$	$\bar{B}_s^0$	<u>s</u> <u>b</u>	5370	...	$B_s^+ + \_$
<a href="#">Upsilon</a>	$\Upsilon$	Self	<u>b</u> <u>b</u>	9460.4	$1.3 \times 10^{-20}$	$e^+ e^-, \mu^+ \mu^- \dots$

Notes: Adapted from <http://hyperphysics.phy-astr.gsu.edu/hbase/particles/meson.html#c1>  
 Anti-quarks are indicated by an underline, e.g. d is an anti-down quark.  
 1. An up/anti-down down/anti-up combination. 2. Down/anti-strange and anti-down/strange mixes.

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