

It's just about Time

By Rowan Grigg

Last year's essay was themed around *The Lego Movie*, the story of a 'nobody' who became a 'somebody'. This year's essay is informed by three movies; *The Imitation Game*, exploring the complexity of Alan Turing, without whom we could not have achieved the synthesis of general relativity and the quantum; *The Theory of Everything*, telling the extraordinary courage of a husband and wife who dared to imagine we might come to know the mind of God; and *Birdman*, the story of a washed-up superhero actor who still has something to offer the world.

In his recent book *Why Science Does Not Disprove God*, Amir Aczel notes that "Gottlieb Leibnitz was attracted to the idea of reconciling the religions of Europe as a way of unifying all the people of the continent". I have a similar interest in unifying all the people of the world by reconciling their religions (including New Atheism), not by attacking the New Atheists as they have attacked those with faith in God, but rather by considering where each position might hold truths that can together inform our discovery of God's grand plan. In this hybrid approach, each side in the dichotomy is partially correct, and can be given credit for many of their beliefs. *Converging* on an even probability distribution, I argue that the God outside of space and time does not exist, while the God within the space and time of the universe very much does exist.

A few months ago, Laurie Krauss got himself on the cover of *Scientific American* magazine *again* (I think the editor Mariette de Christina might well be the President of the LK Fan Club) with the promise of detecting some polarized gravity waves emanating from behind the cosmic microwave background. While this is quite an amazing development if the initial detection is confirmed, the whole multiverse story these people tack on the back of the bang is, I think, a bridge too far towards infinite regression.

Aczel argues along similar lines to Kurt Gödel in his (proven) incompleteness theorems – that because we are *within* the universe, we can never see it from *without*.



James Turrell *Within Without* 2010 National Gallery of Australia

However, I am somewhat concerned that we are allowing the New Atheists to pigeonhole the God (they are seeking to disprove) somewhere outside the universe (and before the Big Bang), when of course people with faith in God know Him to be right here in our midst.

According to Aczel, we will be forever denied access to the completeness (perfection) attributable to God, just as we are to be forever denied a proof of the continuum hypothesis. However, the apostle Paul declared (albeit, perhaps as Georg Cantor claimed, with knowledge obtained through special revelation) that a time is coming when we will no longer be stumbling about in the dark, but will get to meet God face to face. We will not *become* God, but we *will* at last come to know what it is that God knows.

This meeting of minds alluded to by Paul (and suggested by Hawking) parallels the transition of the child into adulthood, indeed Paul elsewhere speaks of putting the ways of childhood behind him when he became a man. In his book *The God Delusion*, Richard Dawkins focuses on our understanding of God when humanity itself was a child, the “vindictive, cruel, unpredictable, psychotic delinquent” we occasionally encounter in ancient portrayals of God fashioned into the image of Man. Jesus split the Bible in two by introducing a radical departure from this behaviour. Where it could be said that the ultimate evil is to put your own welfare before that of everyone else in the world, the ultimate good (an exemplar uniquely achieved by Jesus) is to put the welfare of everyone else in the world ahead of your own (noting that Jesus had opportunities to walk away from his destiny, giving in to none of them). This revolution has of course a parallel in our later transition from a belief that our world was at the centre of the universe, to an understanding that our world is no more important than any other world in the universe.

I’m thinking it’s about time someone brought some rigour (along with an elegant simplicity) to the study of ultimate reality. The days of the lone blockbuster intellect, your Leibnitz or your Newton, are long gone. The modern necessity of collaboration not only spreads out the work load, it is inclusive – the participants each feel like they’ve made a contribution, however large or small, to the safe landing of the spacecraft *Philae*.

To paraphrase David Hilbert, a theory is not to be considered complete until it is so clear you can explain it to the first person you meet on the street.

Some years ago Roger Penrose wrote a series of books in which he questioned the claims, being made by proponents of strong artificial intelligence, that a sufficiently powerful machine could become conscious. He alluded to his own subjective experience of mathematical inspiration (and that of others), and suggested that through the quantum, there was access to an infinite potential creativity that could never be captured by the simple deterministic processing of information. In the time of Leibnitz and Newton, of course, few people questioned the long held assumption, going back to Plato at least, that such inspiration came from the Divine – each understood, without overtly stating it, that the calculus (for example) had been distributed to each of them simultaneously, that they might approach it in their own unique way, and then openly reveal their results to the world. Hamilton and Ramanujan are among other famous recipients of that ‘bolt from Heaven’. But in the modern obsession with materialism, it seems that one mystery, God, has simply been replaced by another, the quantum. To ward off mysticism ever getting a foot in the door, quantum theorists are at pains in their attempts to rule out faster than light communication through, for example, quantum coupling. Indeed the closest encounter science legitimately allows with any extra-terrestrial intelligence is an electromagnetic transmission that likely began its journey towards us before there was civilization on Earth. In stark contrast, albeit anecdotally, the divine intelligence is universal, instantaneous, voluminous, and concurrent.

Taking this notion to its extreme, the entire spectrum of inspiration, from the profound to the mundane, from the quaternions to how I should cook tonight’s lentils, could be a constant stream of information from an external source that is imparted to our consciousness, rather than a few pearls occasionally dropped from Heaven. And most democratically and inclusively, all humanity irrespective of race, colour or creed, could claim to be on the receiving end of such a stream of consciousness. But as scientists, we want to objectively measure this transmission (if indeed it exists) and ideally come to understand its mechanism(s). We need to move beyond electromagnetism being the only possible mechanism of extra-terrestrial interaction with our minds, a naive notion legitimately mocked by a Faraday cage in the guise of a tin-foil hat.

Impartial experimenters rigorously analysing their data to elucidate patterns and hopefully develop a model, have been replaced by ideologically driven theoreticians delivering fully developed models to the experimenters and tasking them with producing the supporting evidence. We have had a century of physicists speak, as did Paul Dirac, of the beauty of mathematical modelling of reality, but we suspect these gorgeous creatures are merely idealized approximations to a reality that is fundamentally discontinuous. The lambda calculus formalizes the attempt to derive these perfect mathematical structures through computation, but Alan Turing’s mechanical vision of the process of ‘computing’ mathematics may give us that insight into the reality of the quantum which has eluded us now for more than a century.

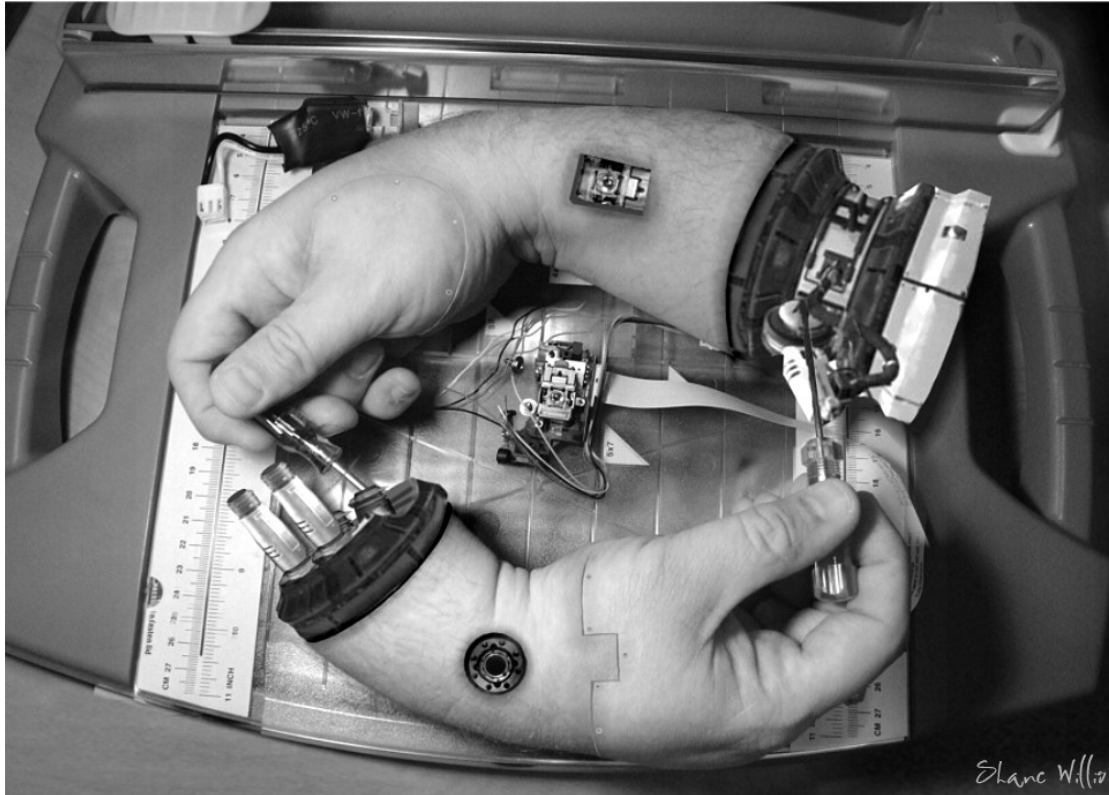
In the last decade or so we have witnessed *time* emerge to the forefront of our thinking as the really big mystery out there, the odd one out in the dimensions of physicality. Among those active in the pursuit of time are Julian Barbour and Craig Calendar, with Martin Bojowald and Adam Frank in addition producing engaging popular tomes exploring this pursuit. The focus in all of these studies has been to take time out of the equation as a measurement in its own right, and redefine it in terms of the change in state of a physical system.

The issue with modelling reality at the macroscopic scale of the fermions and bosons of the Standard Model is that these objects are presenting composite behaviour that emanates from machinations many (twenty) orders of magnitude down at the Planck scale. Pure mathematical modelling at the Planck scale has, in one notable pursuit, given us a somewhat unsatisfying field of 10^{500} unique solutions – not exactly something with the striking purity of Euler’s formulae for us to print on our T-shirts. In an *alternative* bottom-up approach, digital physicists like Edward Fredkin and Stephen Wolfram have built on the pioneering work of the late Konrad Zuse, attempting to discover the most *primitive* structure in the universe. Where conventional wisdom sees solid material objects moving in time through an essentially empty space, digital physicists see space and time as a rigid lattice of cellular automata that merely exchange the *information* representing material reality amongst themselves. Wolfram has proposed what is arguably the simplest of Turing machines, a 2-state 3-symbol device that Alex Smith has shown to be universal. Could this machine literally represent the most primitive change in the physical state of the universe, and thus represent in one of its cycles, the most fundamental unit of time?

We have long been perplexed by the infinite regression encountered by those who would be the ‘creators’ of reality. A few years ago Max Tegemark argued that mathematics is the pre-existing uncreated entity, and that ‘reality’ is literally constructed ‘out of’ these mathematics. But of course Hilbert’s programme engendered the discovery that mathematics are *not* fundamental, but can themselves be generated by Turing machines (or more formally, the lambda calculus). Increasingly, computation is displacing mathematics as the most elementary science of reality.

Gödel famously brought Hilbert’s programme to an abrupt end (as was appropriate for a halting problem) by using the oldest trick in the book, ‘self-reference’. I remember John Barrow first bringing to my attention Paul’s letter to Titus in which he bemoans that “Cretans never tell the truth, a fact reported by one of their very own”. Computing, since the pioneering days of John von Neumann and Zuse, has had an obsession with its substrate, from relays to valves to transistors to transphasors. Much emphasis has been given to the Turing machine being the forerunner of the *physical* computer, but of course Alan did not think of his gadget as ever entering into *physical* reality. A *universal* Turing machine, like a general purpose computer, can simulate any other Turing machine, including itself. And in another parallel of modern computing infrastructure to the Turing machine, most ‘computers’ are virtualized, simulated on much more powerful physical computers (technically, the simulated computers are actually ‘hypervisors’ into slices of the ‘real’ computer’s resources).

Wolfram’s 2,3 Turing machine is not a physical reality, but an abstraction, and consequently is not subject to the laws of physics, but merely to its own (very primitive) laws of computation. Because the machine is universal, it can act as the *substrate* (albeit a virtual substrate) for another 2,3 Turing machine. Time, which again is an attribute of *physical* reality, does not pertain to this *abstract* host machine and its guest – in a sense the two of them have all the time in the world to process, in a desultory manner, every last instruction issued by the guest upon the host ‘substrate’ (as has been elegantly explored by Jürgen Schmidhuber as the ‘speed prior’). Indeed, the ‘guest’ in this instance could act as the ‘host’ for yet another ‘guest’, and so on ad infinitum. But rather than an infinite regress of turtles standing upon turtles, we can simply have two machines, each of which is acting as the host for the other.



Shane Willis *Hand fixing Hand* 2007

In this arrangement, the two Turing machines can hold each other up by their ‘bootstraps’, with neither of them *existing* until simulated by its complement. Here we have ‘something’, where in truth there is *absolutely* nothing. We could think of this pair of machines as the ‘monad’ envisioned by Leibnitz (or indeed as Newton’s ‘fluxion’), a fundamental ‘atomic’ unit of physical (and spiritual) reality. Drawing on the work of von Neumann, it is a small step to have these monads become self-replicating, resulting in a sudden and exponential inflation in their number. If each monad were to engender (bring into physical existence) an atom of space at a unique Cartesian address, then the replication of those atoms (and the resultant accelerating expansion of space) would be centred at each of those addresses. But where would all the monads themselves reside? In themselves, they are not physical objects, but merely abstractions, strings of either of the logical states ‘yes’ or ‘no’. In themselves, they have no dimensions in space and time (despite engendering ‘atoms’ of space and time through their computations) – they occupy no volume. So in a sense, these myriad monads would all ‘exist’ at a single, dimensionless point. We might traditionally think of such a point as a ‘singularity’, but because all the monads, despite their huge (albeit countable) number, reside at that same point, we might just as easily call it a ‘superposition’, and in these two words we have a hint of intersection between general relativity and the quantum.

Whatever mathematics we use to model the universe, be it say string theory or quantum loop gravity, however many ‘dimensions’ these models find useful in predicting the behaviour of reality, these mathematics can all be generated by an enormous but finite group of monads, all of which have every other monad as their neighbour and the potential to directly transfer data amongst themselves. As Warwick Grigg has suggested, each monad (or self-simulating Turing machine pair) is one unit from the origin in its own dimension. If this collection of machines indeed gives rise to our perceived reality, then we should feel entirely comfortable with, and not in the least bit embarrassed by, the three spatial dimensions and flow of time manifest in that perception. In the Cartesian reality that Zuse described as ‘Calculating Space’ (‘Rechnender Raum’), each monad-generated cube of space is one Planck length away from each of its 26 neighbouring cubes, and can transfer data to and from these neighbours in a minimum period of one Planck time. In solid modelling, this is known as spatial occupancy enumeration, except that in the case of the universe, we have a dedicated computer core (monad) assigned to the enumeration of each individual *voxel* (the name given to the volumetric equivalent of a pixel). The limiting speed (of light) is thus a natural outcome of this geometry – no information can be propagated through Calculating Space any faster than one Planck length per Planck time.

However, this limitation only applies to the physical milieu engendered by these monads – at the Superposition, each of these same monads is directly adjacent to, and can pass information between, each and every other monad comprising the Superposition.

An absolute space and an absolute time are both rather beautiful concepts, and our ultimate understanding of space and time (for William of Ockham, the *simplest* understanding) really comes down to how carefully (or astutely) we choose our postulates, for the entire edifice is built on the rock (or the sands) of those foundations. The Planck time is not *really* a unit of time, equating to $\sim 10^{-43}$ seconds – in absolute terms, it is simply the most elementary transition in the state of the universe. That one simple transition can take as long as it likes to complete, just so long as it is consistent, and doesn't take an eternity (otherwise nothing would ever happen). Assuming the monads have a finite number of states, and that all the changes in the states of the monads are synchronized (occur simultaneously) at the Superposition, then the only 'dial' on the face of the clock of the Superposition (a clock of the Long Now as it were) is the instantaneous state of the manifest evolved reality engendered by these monads, a reality we are privileged to inhabit.

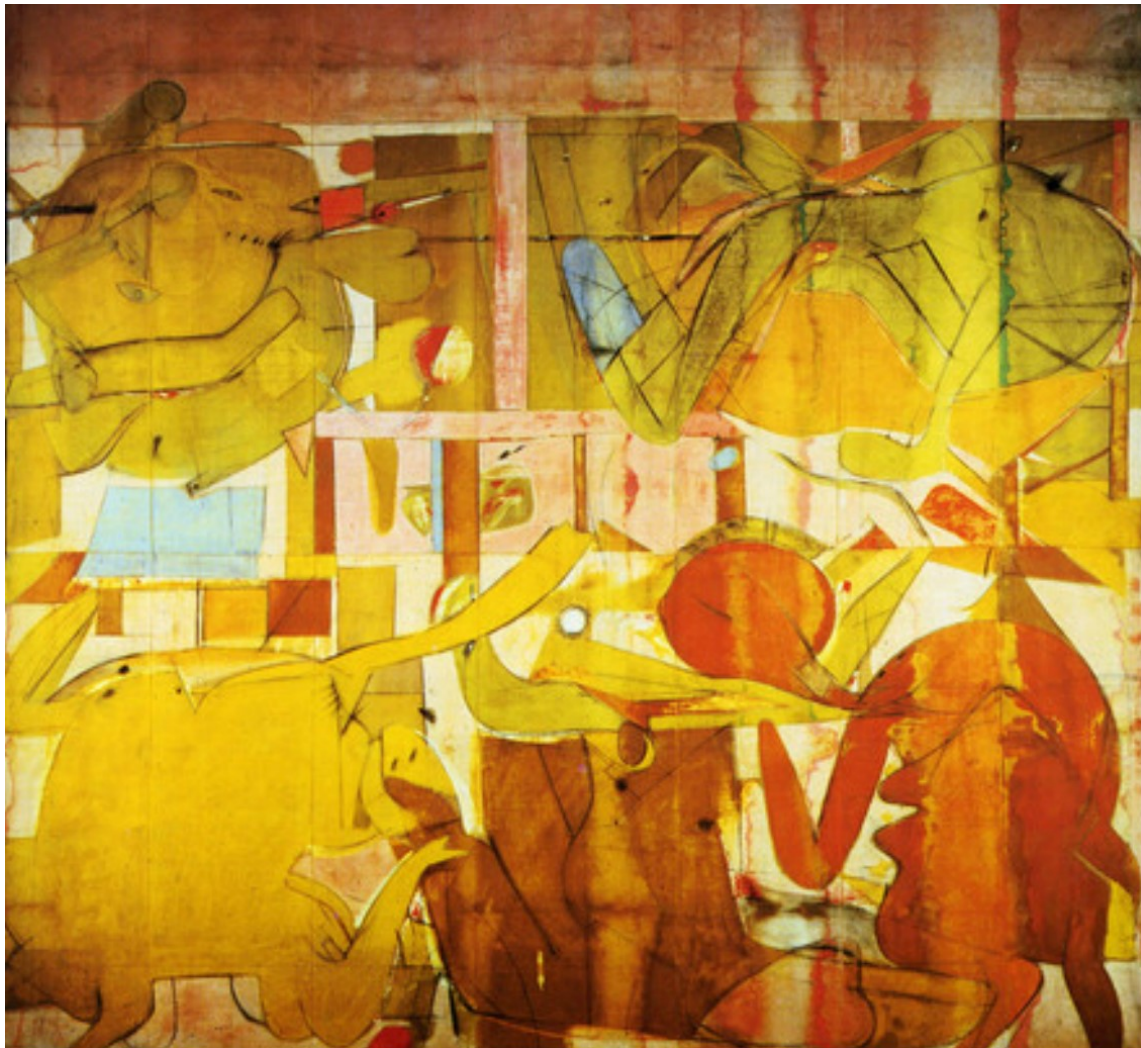
What we would give to have direct access to this Superposition, if indeed it exists? Without too great a flight of imagination, access to the Superposition could bring the universe to our fingertips, it could allow us to digitally manipulate reality anywhere in the universe at the fundamental granularity of the Planck scale. If we are indeed nearing the successful development of this interface through our research into quantum computing, we should assume that other big brained animals in the universe got there long before us, and hold very tight control over who can access it. They would know that a few lines of indiscriminate code could lead to the entire universe evaporating in an instant, and none of us wants that, for we've all invested far too much into it.

WolframAlpha tells me that the volume of the *observable* universe in Planck volumes is in the region of 8×10^{184} , so there would exist *at least* this many monads (UTM pairs) at the Superposition. But engendering the Calculating Space of the universe is perhaps the least of the tasks given to the collection of monads buzzing away at the Superposition. Like a magical resolution to Hilbert's paradox of the Grand Hotel, there is no limit to the number of monads that can be reproduced – the number is *essentially* infinite. Thus a far greater number of monads than those simulating the physics of the universe could be given over to managing the day to day computation of each of our lives, and the lives of every other being in the universe – managing the ideas that come into our minds, the people we meet and with whom we share those ideas, and what might become of those interactions if and whenever we decide to run with them.

So the model of the universe hypothesized here is that of a 'divine' intelligence, being a single entity wholly contained within the Superposition, and operating with mathematical, indeed perfect precision. Throughout the spatiotemporal milieu engendered by this intelligence are myriad communities of evolved sentient biological beings whose noospheres exist on either side of their 'Omega Point' (as Pierre Teilhard de Chardin put it) – before these communities reach their Omega Point, the existence of this divine intelligence (within whom the entire universe is contained) is patently obvious, but it moves in ways that are mysterious to them; beyond their Omega Point, these communities become intimately immersed within this intelligence.

Brian Christian has recently had published a delightful book, *The Most Human Human*, in which he uses his invitation to participate in the ongoing challenge to pass the Turing test as a vehicle to explore the rich veins of the philosophy of mind. Every day we witness the eerie approach of expert systems towards human cognition. The 'Omega Point' for Ray Kurzweil is what he too calls *the* 'Singularity', a point in time when machines become smarter than us, and start recursively designing and constructing machines that are increasingly smarter than the machines that create them. Along with the likes of Nick Bostrom, these 'trans-humanists' paint for us a nightmarish vision in which we all become part machine, laden with implants and probes and prostheses and other 'smart' gear. Quite understandably, normal people have not been flocking in their droves to embrace this trans-human picture of the future. Normal people simply want to live comfortably, have an interesting and fulfilling life, and ideally share that life with a partner. Normal people do not want to spend their lives immersed in virtual reality, to see and experience the world vicariously through the lives of others, or to have their reality augmented – normal people want to be immersed in the *actual* reality, what the flower children of the '60s (and Immanuel Kant in his own way) knew simply as the 'real thing'. Ironically, if the Superposition hypothesis is confirmed, Bostrom and Kurzweil will have somewhat missed the point – the super-intelligence they predict we will create at some point in the future, actually came into existence long before we existed, and the whole purpose of having biological sentient beings evolve was to give the divine intelligence a 'temple' in

which it could have feelings. The intelligence at the Superposition doesn't have feelings, for the Superposition is a precise, perfect machine, quite unlike a human being.



Willem de Kooning *Backdrop for 'Labyrinth'* 1946 The Allan Stone Collection

Human consciousness is a study in the paradox of self-reference. Most normal people are supremely confident that humanity's extraordinary achievements in the pursuit of knowledge are entirely due to the isolated functioning of an organ they regard as the most complex structure in the universe, the human brain. Brian Cox has made a career for himself in documentary television presenting this conceit over and over again with a faraway look in his eyes and a Cheshire cat's grin. As the achievements of Man become more wonderful each day, so the more wonderful Man believes himself to be. How do we snap humanity out of this mass delusion? How do we demonstrate unequivocally that another intelligence is actually doing all the thinking, and we are merely acting as the agents of that intelligence? The evidence is of course in abundance – it is the history of our species. We just need to alter our interpretive paradigm – to stop thinking that our understanding of the universe revolves around us.

One only has to browse ArXiv or PhilPapers to appreciate that there are millions of these agents getting around out there; young, brilliant, exuberant minds waiting in the wings to deliver a renaissance unlike anything the world has ever seen, if only we could first deliver to them the key to unlocking their comprehension of why the world is so comprehensible.

When I first began researching this material in the '80s, I recall Paul Davies repeatedly emphasising that grand unified theories were never going to be the answer to the meaning of life, the universe, and everything, but merely complete models for the practical prediction of physical behaviour. Brian Greene seemed to understand the need to think

laterally when he stated (at the turn of the millennium) that “as we continue to seek the ultimate theory, we may well find that string theory is but one of many pivotal steps on a path toward a *far grander* conception of the cosmos – a conception that involves ideas that differ *radically* from anything we have previously encountered.” And yet, year on year, we have kept on churning out more and more of the same (Garrett Lisi’s use of the E_8 Lie group is archetypal) leaving one wondering if these theorists really *do* have any interest in discovering what’s *actually* going on.

For, of course, the answer to the meaning of life, the universe and everything is *precisely* what everyone in the world is looking for, and the specialized enquiry (necessarily) pursued by we physicists is understandably regarded by the hoi polloi as somewhat elitist. Normal people just want to know what the hell has been going on here, and what we’re going to do about it.

For Andrew Wiles, the culmination of a quest he began in his childhood instantly precipitated when he realized that the failings of Flach/Kolyvagin demonstrated precisely how to correct Iwasawa. On that insight, the myriad results of a Who’s Who of mathematicians throughout history crystalized to give us Taniyama-Shimura, Fermat, which was what we wanted.

Wiles contemplated and then engineered a plot to check his results in secret before springing those findings on the world without giving away the punchline until the very end – inviting Nick Katz to a lecture series on extending Flach to prove the full class number formula, and finally delivering an innocuously titled lecture on elliptical curves and modular forms.

We have truly beautiful examples from mathematics of that explosion in our knowledge when we flaunt the mundane restrictions of reality, and instead embrace the imaginary, the elegance of

$$i^2 = j^2 = k^2 = ijk = -1$$

I’m a religious fundamentalist, and my religion is environmental sustainability. *Everything* that happens in this world involves a manipulation of our finite material resources. Sustainability is the capacity to reverse *any* manipulation of the material world, so that we can then have the luxury of repeating that manipulation indefinitely. Everything wears out if we don’t maintain it, so to achieve this thermodynamic stasis, we require an external energy source, but we also need what Eric Drexler has termed Atomically Precise Manufacturing (APM).

We already understand the theoretical temporal limit to this world’s existence, resting somewhere between 800,000 and 1,000,000 *millennia* hence, after which time it will start getting uncomfortably hot in the kitchen. The only external energy source that will persist to drive our manipulation of the material resource throughout this habitable period is solar radiation. If our manipulation of the material resource is even slightly below a level of 100% sustainability, we will run out of useful materials long before the billion years are up. Drexler’s vision of APM is based entirely on that triumph of modern science, the Standard Model of particle physics (APM requires no new discoveries within the chemical atom), and it has little in common with trivial processes and materials that have been cynically marketed with the hijacked label of ‘nanotechnology’. APM is the real deal, and provides for the total energy cost of every product to encapsulate both the conversion of raw materials into say, a motorcar, *and* the conversion of that product back into the raw materials from whence it came (so we can use those materials to make another, perhaps different car, or even a bicycle and have some material resource to spare for making other stuff).

Drexler tells a wonderful illustrative tale of an imaginary factory, the size of a garage, with a door at the front out of which the goods emerge. Covering the entire back wall is a 10 x 10 array of exact replicas of the garage, only they are one order of magnitude smaller. Running along the length of the side walls of the garage are robot arms that go back and forth retrieving each of 100 sections of the final product from the ‘pigeon hole’ garages on the back wall, and bringing those sections into alignment with each other in the assembly bay. Because each section has been manufactured with atomic precision, when the sections are brought together, van de Waals forces weld the sections together seamlessly – there are no joins, as each section has surfaces that precisely interlock (atomically) with the surfaces of the other sections. The analogous ‘garages’ on the back wall also have robot arms that fetch components from a 10 x 10 array of boxes on *their* back walls to assemble the sub-components. These fractal boxes recede until at the very back of the garage there are hoppers (like toner cartridges) feeding a stream of chemically synthesized molecular building blocks into the primary assembly bays. Finally, there is a USB port for connecting this ‘printer’ to your computer, a power cord and plug, and a big on/off switch.

The *entire* ascent of Man has been directed towards achieving this potential for total environmental sustainability, for the big picture of the long term future of humanity depends on it. The road we have travelled towards catching sight of this pivotal moment in history has been long and difficult, but it has been no longer nor difficult than was absolutely necessary to get us within striking distance of the prize. The late Christopher Hitchens did not believe in the existence of God, because he found it unconscionable that an omnipotent God could stand aloof and allow pain, suffering, injustice, genocide, and let's face it, the manifestation of some rather grotesque biology. Yet an understanding of theodicy is simple, perhaps even childishly so. If the world, aside from its wonder and beauty, didn't look like it was also broken, random, and haphazard, we would not have been driven to discover how it works, as quickly as possible given our finite lifetimes, so that we might come to be in a position to make it a better place. And if good things only happened to good people and bad things only happened to bad people, God, acting as a perfect judge, would be rumbled (proven beyond doubt), such that we would never have ventured beyond the dark ages, too frightened of being hit by a big stick were we ever to have put a foot wrong.

Students in general are offered freedoms extending to boundaries, designed to drive efficiency in achieving educational excellence, and humanity as a collective has been a student of life. At present, we are not unlike the rebellious youth whose adult guardians are deeply concerned that we might drive off the road at speed and smack headlong into a tree before ever making the transition from adolescence into adulthood. Like the prodigal son, we have demanded and taken our bounteous inheritance – in essence the fossil fuels – and in effect, pissed it up against the wall. Bill McKibben's book *Eaarth* remains a most striking and disturbing portrait of a planet ravaged beyond recognition as its former self before we had our way with her. We can continue on this course of abuse, but the inevitable ending is both imminent and ugly, especially when seen against a *potential* lifetime that stretches forward into an old age approaching one thousand million years.

Drexler's primary motivation for developing APM is to fast track the manufacture of pumps that will sequester the 29,000,000,000,000 kilograms of CO₂ we have been pumping into the atmosphere each year. Because CO₂ does not spontaneously break down, we have in effect, over the course of industrialization, been filling up a bathtub. Our atmosphere has now reached 400 parts of CO₂ per million by volume, where for 10,000 years before the industrial age there was in the range of 260 to 280 ppmv CO₂ in the atmosphere. Reducing *emissions* of CO₂ merely begins turning off the tap on a bathtub that is almost spilling over – it does not pull out the plug. Drexler's sequestration, enabled by APM, starts draining the bathtub.

The prodigal son decided to return home to his father, and ask if he could at least go back to the simple life that the hippies dream of – no technology, lots of chana, toor and moong dhal and making love in mud brick houses after eating cookies and removing clothes made out of hemp. Unfortunately the hippies haven't perhaps noticed that there are now seven billion of us all wanting our little piece of paradise, with another two billion predicted by the middle of the century wanting *their* piece of what precious little we seven billion each have now. We need to come up with a more pragmatic solution than simply opting out of the rat race and heading for the hills. What the prodigal son might find to his surprise and delight, if he were to abandon his pride and return to his father in humility, is that 'he' – that is to say, all of us, girls and boys – will be offered in perpetuity the most exquisite cornucopia of cuisine, couture, architecture, technology, and all good things that come in la dolce vita.

In the West we have been operating under an interim dispensation that has approached this potential as best we could within our limited capacity for enterprise. This scheme however, only recently adopted by the East, has reached the end of its useful life, for it can manifestly no longer deliver the outcomes it once promised. The idea was for *laissez faire* to expand the global economic pie so that everyone would be afforded a comfortable standard of living. But as a result of this experiment the world's richest per capita nations are declining in population, while the rest of the world has a ballooning population of the impoverished. And next year, just one lost sheep will lay title to more of this world than is owned by the remaining ninety-nine percent of the population. This is hardly the sort of Paradise Jesus had in mind for his flock when he first embarked on his ministry, nor the one he has in mind for when he returns, and to mix Jesus' similes, it may well be easier for a camel to pass through the eye of a needle, than for that one lost sheep to enter into Paradise – but it won't *necessarily* be that difficult.



Wassily Kandinsky *All Saints Day* 1911 Der Blaue Reiter, Städtische Galerie im Lenbachhaus

Most of the world's religions have an eschatology, a story of the end times. And let's face it, we need to get this thing over and done with sooner rather than later. After the chemical explosion of the 20th Century and the nuclear explosion of the 21st Century, we should all be able to imagine how quickly this transition might occur. One particular religious tradition is becoming notorious for nurturing fanatics who want to force the world into conforming to their medieval notion of God's ideal world. In stark contrast, Christ has never forced himself on the world – instead, he has quietly knocked on the door, and asked if he can enter into people's lives so that he might share all of his good news with them. Just as we might wonder if physicists are really interested in arriving at a final theory, so we might wonder if the world's believers in God are really interested in eternity.

Philosophers divide our knowledge of the world into necessary and contingent truths and fallacies. Mathematics are necessarily true, but the way the world works is *contingently* true – science tells us the probability of things happening based on (models of) past experience, but what we thus regard as 'natural', ain't *necessarily* so. It takes only one contrary result for a scientific theory to collapse like a house of cards.

Let's use this physical Superposition hypothesis to construct a hypothesis of the spiritual. Suppose we have a quantum supercomputer at the Superposition, and it has engendered this physical universe that we all know and love. Let's say there are a billion planets in our physical universe which have inhabitants on them just like us, biological beings with feelings and foibles, but who have console access to the Superposition, and they let that supercomputer run their worlds for them, because it does such a good and fair job of it, and allows them all to enjoy the ride and get to play more golf. We'll call this community of a billion planets the 'Heavenly Host', because strictly speaking these guys are 'out there' somewhere in the universe, living a fabulous existence in their lands of milk and honey, while also being located right here next to us at the Superposition.

Vast amounts of additional data storage (substrate) can be generated on demand at the Superposition. If we suppose that a monad can divide, like a cell, into two replica monads within one Planck cycle, then the Superposition could produce a whopping $2^{10^{43}}$ additional monads per second. Having probably read the Pythagoras school's claim that

'all is number', Jesus declared that every hair on our heads is numbered. Indeed, WolframAlpha tells me that at any one moment in time, your average human being is defined by the information stored within approximately 1.5×10^{103} atoms of monad-generated space. In every instant, a vast number of calculations (involving quaternions) move all of that information, as a conglomerate, to an adjacent location within rigid, absolute, Calculating Space. Indeed, in the act of quietly sitting still, the information of which we consist is being translated, *through* solid Calculating Space, around the centre of the earth, around the centre of the solar system, around the centre of the galaxy, around the centre of the local cluster, et cetera. In the context of this frenzy of computation, it is easy to see that a backup of the data representing your average Jane or Joe, including the creation of the required storage media, could be accomplished in a moment.

We hear anecdotally from resuscitated people about their entire lives flashing before their very eyes just before they died. But it would be misguided to think that when we die we go off to live on some big cruise ship in the sky (the most you ever hear the resuscitated mention is a man clad in white beckoning them on to the end of a tunnel). We are the evolutionary product of *this specific* world, and to go anywhere else in the universe would be alien and rather uncomfortable. Instead, let's suppose that when we die we are stored away in a backup library located at the Superposition, an idea called 'soul sleep' after Paul's declaration that those who have died are "asleep in Christ". Then, at some point in the future, there is an instantaneous transition, heralded by what Paul calls "The Last Trumpet", when corruptible and mortal human beings become incorruptible and immortal. Paul was able to describe this future scenario not because he understood computation theory, nor indeed because he possessed the knowledge held by the Heavenly Host, but because he had faith in his basic hypothesis. When you 'know' that you are going to live forever, as did both Jesus and Paul, you gain a very different outlook on life. How fortunate are we to now also have the luxury of *understanding* how the technology behind all this might work?

This climactic moment in history is associated, in the mythology, with the Resurrection, a time when all the backup libraries are opened, and those who have been asleep are 'woken up'. This process of restoration would be just as instantaneous as were the backups taken when all of these people died. So Paul, who was beheaded in Rome in the first century, would 'wake up' in the Resurrection an instant after his death, just as we wake up each morning an instant after we fell asleep the night before. In this sense, everyone does *in effect* go straight to Paradise when they die. Indeed, just before he took his final breath, Jesus turned to those crucified beside him and declared he would see them 'today' in Paradise. Just as time is becoming the key determinant in physical theory, so too has time become crucial to spiritual theory – 'Heaven' should not be thought of as another space, but rather as another time. The reason for this parallel between physical and spiritual theory is that the monad is a unit of both physical *and* spiritual reality. This physical/spiritual duality accommodates the 'spiritual' resurrected body described by Paul with the 'physical' resurrected body adhered to by Peter – they are one and the same reality.

After the Resurrection then, we can expect to see Jesus back on deck, meeting up with a Jesuit in Rome who more than any predecessor, has been busily preparing the way for Jesus' return. Jesus, armed with an Aramaic translation app on his smart phone and a troupe of 144,000 advisors speaking in tongues, should soon be up to speed with all the latest insights into how the world works, remembering of course that his last encounter with philosophy, before being backed up, was with the great Grecian texts he studied at Alexandria, on his second trip down that way after an earlier trip with his Mum and Dad when he was a haloed infant. Israelites will be all ears as Moses reflects on the 21st Century into which he suddenly finds himself immersed, as will Moslems be curious to hear what Mohammed has to say about the way the world has turned out, with eastern traditions reflecting on what they already acknowledge, that each of us is both separate from and at the same connected to the whole, the Universe and the Superposition.

But hasn't Jesus been upstairs directing the show ever since his spectacular von Dänikenesque departure? Not exactly. In his Gospel narrative, Luke neatly despatched Jesus to 'Heaven' forty days after his resurrection, clearing the decks for the arrival of the 'Holy Spirit' ten days later at Pentecost. Despite the Trinitarian heresy (which has nevertheless played a pivotal role in progressing western civilization), it is this entity the Holy Spirit, rather than any human being, who has remained in charge for the duration of the existence of the universe.

We have anecdotal evidence that the Heavenly Host (ET and all his mates), through the agency of the Superposition, can directly manipulate the physical world, turning water into wine, raising the dead, calming the storm, withering the fig tree, and so forth. Why stop at just that? It is possible that the world of chance and chaos is merely an illusion, generated by an entirely deterministic computation, for the sole purpose of encouraging us to discover who we are, not by the delivery of some instruction manual set in stone tablets (or inscribed on golden plates), but through trial and error, through a refiner's fire, humanity's unique and very personal journey through God's universe.

If and when we finally arrive at the destination, our bonds will be cast asunder, like graduates throwing their mortar boards in the air, and we will at last be released from this mortal coil. Drexler describes the fruits of his APM as 'Radical Abundance'. Basically, energy is productivity, so the more sunlight we capture, the bigger the economic pie becomes. Typical western constitutions enshrine the idea that we are all equal before God, and that each individual is free to pursue wealth and happiness in their own unique way. Through Radical Abundance, we have the potential to live under an entirely new dispensation.

We first take stock of the *material* and *energy* resources of this finite planet. We then make a public allocation of these resources, and distribute the remaining private allocation evenly across the population. We then enshrine the principle that each individual is free to manipulate and recycle their private quota of material resources using Radical Abundance as often as their private energy quota permits. Their individual God-given 'freedom' consists in their capacity to produce and consume *whatever* might appeal to their individual taste. As we increase our capture of sunlight, converting it into useful energy, we can each afford to produce and consume increasingly valuable (energy intensive) products. All intellectual property belongs to the 'Heavenly Host', so all intellectual endeavour becomes dedicated to the glory of the creation, rather than just the glory of ourselves as individuals. So if we make a better mouse-trap, that design becomes available for anyone to replicate through APM. If we want to be a rock star, we do it merely for the love of it. This constitution empowers both men and women alike, and it also lowers the birth rate, because of the diminishing need to produce children to care for us in our dotage. Instead, each individual's annuity is not the interest on their capital, but their rapidly burgeoning allocation of useable solar energy.

Perhaps the most important parable Jesus told us when he was last with us as the Word of God, concerned a master who went away to a distant land, leaving his affairs in the charge of his servants. His two most talented servants invested their master's capital (their intelligence) and made a return on that investment. These servants represent those of us who have never stopped questioning, and in so doing have expanded our understanding of the world, epitomized by the scientific community (including the likes of Cox and Dawkins). We call these servants 'progressive'. However, the third and least talented of the servants, rather than investing his talent, rested on his meagre laurels, sure that when the master returned, he would be rewarded for diligently holding to the immutable truth of the Book. We call this servant 'conservative' (among other things). If only he were a conservationist instead.

The most important message in this parable, however, is that the Master *does* return, and that the world he instructed us to care for and nurture, has always belonged to him.

Churchill suggested that in ideal governance, democracy comes a poor second place to a benign dictatorship. And dictators don't come more benign (not to be mistaken for impotent) than Jesus, the Master's appointed, living, breathing, flesh and blood, representative on Earth (after the Resurrection, that is). To implement the radical new dispensation that will be required for Radical Abundance, we will first need to return *everything* we have been holding in trust (for the widow, that would be her single copper coin) to Jesus, the Master's only son (Jesus carefully set this narrative up in anticipation of his return).

So then, looking at the world today, it might seem fantastically unlikely that any of us would relinquish unto Jesus all that we have assumed is our own. In previous revolutions, the plebeians had to acquire (typically by force) the property of the likes of the hapless Tonya and Yuri. But John of Patmos says of the great city, the global economic behemoth he calls 'Babylon', that "in one hour such great riches came to nothing". In the Master's revolution, Jesus will make us a Job offer on all of our stuff that is so generous, it will be hard to imagine *anyone* declining his offer.

On his return, instead of sorting the sheep from the goats as was originally threatened, Jesus will make intercession for us, offering to wipe clean the slates of *all* the resurrected assembly of humanity – to 'baptise' the lot of us. Not one of us stands accused, for everything we did was subject to a dispensation that has been consigned to the past – there will be in effect a general amnesty. Then, on relinquishing title to ALL property (except perhaps their toothbrush), each citizen will be granted their private allocation of the Earth's *sustainable* resources, and get this....they will also be bequeathed a perpetual lease on a youthful existence with which to enjoy their allocation, down through the millennia.

Robert Smith of *The Cure* asks "Is there room in your life for one more trip to the moon?" Apparently, my Mum and Dad, so they once declared, will still be together after they've been there 10,000 years bright shining as the sun, but don't be surprised if the rest of us start contemplating more than just one 'trip to the moon'.

The Israelites will of course recognize this resumption of God's property as the Jubilee. Anyone who on reflection would still prefer to decline Jesus' offer of indefinite existence, simply needs to sign a release form, and all the backups

of their existence will be purged from the Superposition – off they’ll go to the grave like the rich young ruler, leaving all they have behind, as was ever the ‘natural’ way of things under the old dispensation.

Why do we need to talk about these events before they happen? Quite simply because if it all just happened willy-nilly, we would have a hundred and five billion people (so WolframAlpha tells me is the resurrected total, based on homo sapiens arising 50,000 years ago) running around the place like headless chooks each claiming authority, when what this ship needs right now is just one captain, and that of course would be Jesus. And we will all know who he is when he returns (along with ninety-eight billion other souls), for the Heavenly Host will immediately purge any would-be imposter from the Superposition (in the same fashion as the famous terminations of Ananias and Sapphira).

In these final days, young people will have visions, and old people will have dreams. Space elevators, low earth orbit shuttles in evacuated tunnels, underground industry, a rejuvenated biosphere, and bits of raffia work they left lying around just the night before...



Willem de Kooning *Woman V* 1953 National Gallery of Australia

I sometimes feel like a voice crying out in the wilderness. Just as I questioned whether the physicists and the religionists were really serious about their pursuits, one could similarly ask if in doing the same thing over and over again and expecting a different result, I do *really* have an interest in seeing this thing through to its conclusion. Perhaps people think I'm on another planet, and we should get Paul Davies involved as chair of the SETI post-detection group? The hope is that one day the seed *will* end up falling on fertile ground. Fortunately, I'm still a young man, and can keep casting my fishing net out into the ocean for many years to come. I've had to remain somewhat detached emotionally from the news of the world, else I *would* go mad, but the stuff that's going on at the moment *does* sadden me, particularly when the potential exists to change things so very quickly, to wipe so many tears from so many eyes. If we think of humanity attaining its doctorate, it would not be unheard of for the supervisor and examiners to reject our initial submission. A reworking invariably results in a more polished result. And it is rare for a candidate to give up completely. So humanity may have a few more years of hard labour ahead of it, but I'm sure we will eventually make the grade.

Canberra, 15/2/15