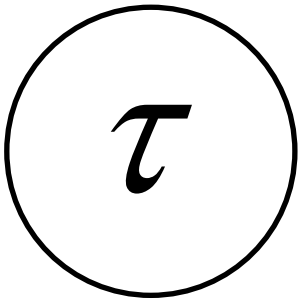
The Aethereal Universe



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INTRODUCTION TO THE AETHEREAL UNIVERSE.

Science has been dominated for two hundred years now by a *materialist* vision of reality. So much so that many scientists, philosophers and ordinary people have come to believe that this materialist model is the *definition* of science. The essence of this model is captured by the image of 'particles in a box'. Physical systems break down into discrete *material parts (particles* being the smallest parts of matter), which are contained in *space*. The parts interact, moving in space according to laws of force. The three-dimensional space of the universe is seen as the container of all things, and physical particles are seen as the fundamental components of all things. Thus we have a dualism of *matter plus space,* and the view that *anything that we can't see as a form of matter in space is unreal.* This appeals to our sense that we can *see everything.* When we look across the paddock we can see whether the cows are there. If we can't see something in space interacting with other things then we doubt its reality.

This model is extended to a *metaphysical model of reality* by Materialists, with a capital M. These philosophers hold that a materialist model applies to everything that exists. They apply it to mind and consciousness, arguing that these must be no more than brain activities – particles interacting in your brain-box. They apply it to everything else we can talk about too – values or morals, spirits or souls, God or gods, feelings or emotions, wills or desires, meanings or references, as well as abstract concepts of non-physical sciences - like culture, society, laws, institutions, ideologies, motives, etc. For many people today, particularly those of a *scientistic* bent, meaning those who support science ideologically as the superior form of knowledge and rationality, science is seen as proving this materialistic model; and although science is not finished, they assume all future science will confirm the same model.

This view probably reached its heyday in the 1960s-1980s – when science had a much better reputation than it has now, and expert authority went largely unquestioned. But even then, seeds of doubt had been deeply sown by new sciences – quantum mechanics, relativity theory and cosmology all pointed to strange and mysterious aspects of reality that could not be easily comprehended within the Materialist model. Certainly these cannot be comprehended in the simplistic C19th 'particles-in-a-box' theory. Materialism, of course, has always been positively rejected by religious and

spiritual people, and by those who believe in psychic phenomenon (psi), or in subjective phenomenon going beyond material causation. Such non-Materialist 'metaphysical' beliefs are justified by holding that there is simply more to reality than physics knows about.

In fact, many people hold this simply as a matter of common sense. The subjective world is evidently real: if you are reading this you have thoughts and consciousness. But your subjective entities cannot be publicly observed, and there is no scientific explanation of how thoughts can be produced from matter. In this respect, the Materialists can only state a general dogma that *the explanation of consciousness, whatever it is, must ultimately be materialist,* without having any specific explanation to justify this claim. This is the thin edge of the wedge of scepticism about science: if materialist science cannot explain ordinary consciousness, then perhaps there is a whole realm of existence it does not deal with, and perhaps claims about spirits, God, morality, value, etc, also cannot be judged on the 'public' evidence of physical science, which only measures things in physical space. Instead these realms of knowledge depend on the evidence of 'private' experience or introspection (which may include revelations by prophets, visionaries, psychics, or ordinary people with unusual experiences). The scientistic Materialists object that this is not *scientific*. Spiritualists counter that it is just not based on *materialist science,* but the evidence is still real.

The present essay rejects the Materialist view, and holds that *materialist physics is indeed missing a large part of reality,* and this reality is the real source of metaphysical beliefs of spiritualists. But rather than drawing on evidence from metaphysics or spiritualism or religion, the key argument here is scientific. It is well know that physics is in a bit of a fix at the moment. It has four main areas of theory that are mutually incompatible (*quantum mechanics, relativity theory, cosmology and thermodynamics).* These all describe apparently fundamental aspects of physics, but they do not go together properly. Thus the Materialist vision of a single physical reality is not borne out by present physics – which gives us four different and incomplete realities, at different levels of physical scale. Physicists have become increasingly desperate, over the last thirty years, to try to find a *unified theory,* meaning a single foundational theory, from which the other four well-established theories arise. It is widely assumed that this will be like the present quantum theory of

particles, but incorporating gravity as an extra force, and somehow resolving cosmological and thermodynamic anomalies. Hence it is widely expected that this 'grand unified theory' or 'theory of everything', as physicists modestly like to call their imaginary friend, will support a fully Materialist theory of Everything.

The argument here is that the *unifying theory* is likely to be a radically different type to present physics, of a kind that does *not* support the Materialist vision at all. Instead, I propose that the new theory will expand the dimensionality of space, and reveal a whole new set of causal interconnections. It will unify the 'substance' of the world in a single substratum (the 'aether'), but this substance is not matter. Rather, material particles are forms or shapes of the substance in motion. You can't stick this substance in a box, either: *it is the box.* The *aether* is both the container and the particles contained. Thus the conventional duality of *matter + space* is dismissed. Most important, present physics strongly points to the existence of such interconnections in nature, and to the fact that there is a lot more structure and information in the world than apparent from conventional physics. This information has nowhere to be in the materialist model: instead it is contained in the higher-dimensional structures of the aether. It is proposed that these structures are what people experience in spiritual awareness and other non-physical experiences.

Now of course you will ask: *is this unified theory true? Is it scientifically proven?* I will discuss that a little later, and show it does have strong evidence, but the main point to start with is simply that *it is just as valid as a framework for a unified theory as any other presently known,* and if it is indeed the right kind of unified theory, then physics will take on a non-materialistic foundation at its very heart. That is to say, there is no implication from present physics that a materialist framework is inevitable. This must open our eyes to the real possibility that reality contains far more complexity than we can see through the surface of ordinary physics. Equally, the assumption that any future unified theory must follow the same pattern of present materialist theories (*matter + space*) blocks progress in physics itself.

The Aethereal Universe (*TAU)* is a recently proposed *unified foundational theory,*[i] giving a specific cosmology for our universe, and claiming good empirical and theoretical evidence. While this is proposed as physics, the most dramatic

implications are for *metaphysics*. An introduction to the physical ideas is given first, so we can picture the model, but the metaphysical implications are the focus. TAU transforms the nature of the world, and the central point here is that it overthrows the kind of reductionist materialist model that a unified physical theory is expected to support. This is an introduction to help visualise the mathematical model. It presents the main concepts with illustrations. It will be seen that there are many topics from conventional philosophy that are re-questioned in TAU, and I have only tried to survey some key concepts. The aim is to try to demonstrate the challenges and opportunities that TAU represents, not to solve them all here.

Physicists have long thought that there is a 'unified theory', and been confident for half a century now that they are only one step away from it; but the formulation of such a theory has eluded them. It should be remembered that they *have developed no unified theory at all so far*. It is not that they have developed theories and found they don't work - its not like they have an adequate framework, but they just can't find the right *functions* to put in – physics presently has no viable framework and no idea how to write a 'unified equation'. However when physicists speculate on the framework of such a theory, they assume it will have the same sort of *materialist ontology,* the same sort of construction, as they see in their present theories. TAU shows that *this* expectation is wrong, and it has trapped physics in a circularity: the unified theory cannot be formulated in the current materialist model; and materialist models do not reflect the metaphysics of the unified theory.

TAU provides a powerful *scientific* argument in favour of the reality of 'metaphysical entities', and I believe it forces us to relocate self and consciousness beyond the physical world of particles – embodied in a larger reality than the physical particle level. I think it shows that the grand metaphysical schemes to explain away the mind, consciousness, self and soul, through *reductionist materialism,* that have dominated 20th Century 'scientific philosophy', are smoke-and-mirrors. These academic philosophies claim to *explain away* all kinds of metaphysical entities, and create a perfectly logical, rationalised, sanitised 'scientific world view', built on particle physics. But you cannot successfully explain away realms of entities as non-existent *if they really exist.* You cannot successfully explain the universe as a three dimensional mechanism *if it really has four or five or six dimensions*. You cannot explain away time as a directionless materialised dimension *if it is really an irreversible flow of*

change. All the materialist explanations in the world leave these real problems untouched, and all the thousands of books explaining the rationality of modern space-time physics leave the laws of physics without any more unity than before.

The Aethereal Universe unifies our world in a dramatic transformation, a melding of the present paradigms of physics into a new kind of '*scientific metaphysics'*. In this larger universe, physics and metaphysics are tied together. They are both extensions of the Aether. We may say, in an image from gnosticism, that what we call *physics* is the outer world of light, and what we call *metaphysics* is an inner world of vibrations. Both are real, and part of one whole. Metaphysics has always been with us, but in modern times it has been hidden behind the shadow of Matter. The Aethereal Universe illuminates what has always been there in the darkness of modern physics. But it has little *content* without interpreting metaphysical knowledge.

TAU shows us that *metaphysics may be forced on us by physics*. It builds a bridge between the two worlds. TAU connects precisely to modern physics, and this is written in mathematics. But it is a mathematics of shapes and forms and spaces, and we know shapes intuitively. The physical concepts are presented here visually, so the geometric construction of TAU can be imagined at that of our own physical universe.

TAU connects very precisely to orthodox physics *at a few exact points*, and the broader scheme of conventional physics follows from this. This has been the labour of physicists and natural philosophers over the last four hundred years, from Copernicus, Galileo and Newton, to the mid-20th Century, where it culminated in *relativity theory* and *quantum theory.* These are often called 'the two fundamental theories of physics'.[1] In TAU these are still 'fundamental physics', in the sense that they are the ultimate level of ordinary physics. We cannot break *matter* down into smaller parts than our sub-atomic particles (like electrons, protons or quarks, photons, etc). We cannot break *space* down into a deeper structure either. These fundamental theories cannot be pushed any further *in their own terms,* which are the terms of material physics. But in TAU, these are no longer the *foundational theories.* They are founded on a deeper theory, with a kind of 'logical ontology' and 'logical laws' – or better, a *geometric theory.* E.g. in TAU *the ordinary physical constants are no longer*

[1] Although I include four domains as 'fundamental': *quantum mechanics*, the *General Theory of Relativity, cosmology* and *thermodynamics.*

fundamental, and its laws are not the kind of 'physical laws' physicists are familiar with. TAU reproduces the laws and constants of ordinary physics as approximations, as *constructions from a deeper substratum*, that is not itself material.

This is a metaphysical transformation of physics, induced by taking the naturalistic search to its limit, and finding the edge of the physical universe. We discover there is a real world that lies beyond particles. At first this is very surprising, especially from the intellectual space of materialist physics or materialist philosophy. But from a common sense perception, too. And yet we have been living in this metaphysical world all our lives, and across thousands of years of civilizations; it is familiar to us because we are present in it, and we are filled with its folk-knowledge.

Many ancient civilizations discovered and explored and recounted metaphysical worlds, long before modern science was developed. Archaeologists have been rediscovering our legacy of metaphysics through the study of previous civilizations, philosophies and religions. There are many eerily striking similarities of themes, concepts, symbols, across these diverse cultures, expressing the mystical concepts they most prized, as they bloomed into great civilisations. Like ours too, with roads and cities, libraries and hospitals, churches and theatres, shops and markets, factories and merchants. It is good to remind ourselves that we are not the first human civilisation to build a world from thought.

That is what the Aethereal Universe illuminates. It allows us to make the metaphysics discovered by diverse civilizations fully real, *consistently with naturalistic science*. But the point of view of 'naturalistic science' itself is moved. At present 'metaphysics' appears surreal to scientists. With TAU, metaphysics becomes the guiding light again. TAU makes our metaphysical possibilities concrete and our choices real. It gives us existential hope that reductionist materialism crushed with its inescapable and terrifying nihilism.

Whereas TAU connects to physics in a simple way, its connections to metaphysics are multiple and various, and can hardly be summarised because of the sheer historical volume of metaphysical sources in any case. Instead of comparing in detail to many other systems of metaphysics, here I focus on key types of entities and realities posited by realist metaphysical belief-systems, but so common as to be *folk concepts.*

What does TAU mean for these? Are they natural constructions? While TAU connects to physics very exactly, with mathematical identities that hold to numerous decimal places, the connection to the panoply of metaphysics is naturally more qualitative – and yet in some ways it is the most important evidence. The presentation here is not meant to try to prove this, only to draw out some key implications, and establish a basis for thinking about these relationships in the context of TAU.

TAU has answers for some basic issues in metaphysics, essentially by *liberalising* it. It cannot settle our beliefs about existential or moral or religious metaphysics. That requires *content*, and our judgements will depend on our own experience, understanding, wisdom, history, imagination and sense of humour. But TAU makes a new naturalistic framework for these questions, and makes them genuine forms of knowledge, in contrast to the conventional scientific paradigm, which denies them legitimacy. TAU brings them back to life in a way Enlightenment thinkers would recognise as a genuine part of *natural philosophy.*

I pose the metaphysics in two main stages, first the physical model of TAU, then more specifically existential metaphysical themes in TAU. A third part, a comparison against other writers who exemplify complementary approaches to science and metaphysics, is left for an expanded version of this essay.

- First, introducing the physical picture, there is a new image of *physical time, space and matter*. Most simply, adopt a universe with *multi-dimensional manifold (space) and time flow (a spatial universe with a past, present and future).* This revision extends, within the strictly physical development, to a revision of the metaphysics of *reductionism, part-whole structure, information, causality, laws of nature*.
- Second, there are the questions of what this means for specifically challenging metaphysical questions: what is the real nature of our identity, soul, spirit, permanence, afterlife, judgement, God or gods, purpose, and the basis in value of our experiences in this life?

In the first step, we have to leave behind the 4-D *space-time* of relativity theory, and go into a multi-dimensional manifold of shapes and forms, vibrations and harmonies. The 6-dimensional Aethereal manifold is a distinctive shape and form, dancing in real

time. We see the physicist's world of 'particles' shrink from *being the whole world* to being only the surface of the world. We see *space-time* dissolve, and *time flow* reappear in the universe.

I should emphasise that there is one primary claim that TAU depends on, that we really live in a *multi-dimensional space.* In the present model this is a 6-dimensional hyper-space, with forms or shapes defined by 5-dimensional hyper-surfaces. This hyper-dimensionality is ultimately the source of *metaphysical* novelty, opening the door to entertain *hyper-dimensional entities*. The plausibility of *this* – i.e. hyper-dimensional space models – is the real question about the plausibility of TAU. If you already judge hyper-dimensional space as plausible, then TAU is plausible too. I will brief mention this topic here.

John Gribbon, 1993, *In the Beginning*.

"Instead of the collapse of a black hole representing a one-way journey to nowhere, many researchers now believe that it is a one-way journey to somewhere – to a new expanding universe in its own set of dimensions. Instead of a black-hole singularity 'bouncing' to become an exploding outpouring of energy blasting back into our Universe, it is shunted sideways in spacetime.

The dramatic implication is that many – perhaps all – of the blacks holes that form in our Universe may be the seeds of new universes. And, of course, *our own universe may have been born in this way our of a black hole in another universe.*

… This is a spectacular shift of viewpoint, and most cosmologists are still struggling to come to grips with it. … Our Universe has to be seen as just one component of a vast array of universes, a self-reproducing system connected only by the 'tunnels' through spacetime (perhaps better regarded as cosmic umbilical cords) that join a baby universe to its parents. … But how did the whole thing get started? Where did the first universe or universes come from?" p.243-244.

Space appears three dimensional to us in ordinary common sense, and in classical geometry of course, and this 3-dimensionality has been the fundamental assumption of science until very recently. However the 'invisibility' of extra dimensions is because we can only perceive three dimensions of ordinary *motion*. Our visual imagery is tuned to three dimensions, our sense of touch is three dimensional. Life-sized objects are 3-dimensional. Motion is all we feel we can control in the physical world. But on a very tiny scale, it is entirely possible that atoms or particles 'vibrate' in additional dimensions of space that we normally do not see. Indeed it is now widely thought by physicists that this is the case, in one way or another.

It should be noted that (conventional) *string theory* has been the leading hope to create a unified theory of physics, but TAU represents a completely different approach. String theory proposes multiple dimensions of space-time (10 or 11). String

theory has not succeeded in constructing *any real theory of physics yet*, and is increasingly subject to criticism. All it has is a possible mechanism for gravity. It has not found any real theory to use it in. But the appearance of *multi-dimensional space* in physics helps confirm the plausibility of hyper-dimensions used in TAU.[ii] TAU shows why these dimensions are needed: *there is too much physical structure to fit in three dimensions!*

The Aethereal Universe is a real alternative to string theory, and unlike string theory, it is a genuinely unified theory, with strong predictions, not just a 'framework' for a possible theory. While string theory is very much a *mathematical* device, the Aethereal Universe introduces the extra spatial dimensions in an integral and realistic way. It specifies in some detail *what the extra dimensions of space actually contain*. It opens a host of metaphysical questions to science because it implies that our multi-dimensional space has a detailed, *structured content*, lying beyond the realm of ordinary three-dimensional space of 'particle physics', but integral to causality and existence and experience in our world. Metaphysical questions of all kinds, that were supposed to have been buried with modern materialism, are reopened as realistic issues.

http://en.wikipedia.org/wiki/Descartes%27_vortex_theory#Recent_theorizing

(Wikipedia)
"Bernhard Riemann assumed in 1853 that the gravitational aether is an incompressible fluid and normal matter represents sinks in this aether. So if the aether is destroyed or absorbed proportionally to the masses within the bodies, a stream arises and carries all surrounding bodies into the direction of the central mass. Riemann speculated that the absorbed aether is transferred into another world or dimension."

Here TAU bridges to metaphysics, old and new, filled with claims of *other dimensions.* 'Spiritual dimensions', 'celestial spheres', 'planes of existence in other dimensions', 'other-dimensional beings'.[iii] Physicists generally scorn spiritualist claims that a spiritual world exists 'in another dimension', or connects to us 'through another dimension', saying that *there is no sign of your 'other dimensions' in physics and there is no theory of it and you could invent any 'dimension' you want.* But since physicists themselves have embraced 'other dimensions' over the last 30 years (as well as 'dark matter', 'dark energy', metaphysical substances to 'tune up their theories', and make them work), they can no longer make this reply without hypocrisy. They have done exactly the same thing: seeing there is some *real phenomena* that has to be explained, they explain in their own terms as best they can –

in the case of physics, invoking mysterious 'dark' material substances, and 'strings' vibrating in new dimensions of 'space-time'. This is *metaphysical,* yes: but it is not *unscientific* on that account, nor is it necessarily wrong. It is unproved. It is the first step in the creative process of science, when you are groping for an *ontology* to base new explanations on.

Of course a pathology sets in at some point. Physicists continue to spend vast sums of money looking for dark matter, and retain their faith in the missing substance long after it is apparent it is not there, and dogmatically reject other approaches, and this is when it tips over the edge from being 'creative theorising and research' to 'pathological scientific dogma'.

http://en.wikipedia.org/wiki/Greek_philosophy#Pre-Socratic_philosophy

MILESIAN SCHOOL (Wikipedia)

"Thales inspired the Milesian school of philosophy and was followed by Anaximander, who argued that the substratum or arche could not be water or any of the classical elements but was instead something "unlimited" or "indefinite" (in Greek, the apeiron). He began from the observation that the world seems to consist of opposites (e.g., hot and cold), yet a thing can become its opposite (e.g., a hot thing cold). Therefore, they cannot truly be opposites but rather must both be manifestations of some underlying unity that is neither. This underlying unity (substratum, arche) could not be any of the classical elements, … Anaximenes in turn held that the arche was air, although John Burnet argues that by this he meant that it was a transparent mist, ***the aether****. … The Milesian school was searching for a natural substance that would remain unchanged despite appearing in different forms, and thus represents one of the first scientific attempts to answer the question that would lead to the development of modern atomic theory."*

It has occurred to people that the mysterious new 'dimensions' of physics are the same 'dimensions' that spiritualists recount. The 'spooky' features of quantum mechanics, in the same vein, are often referred to in theories of the paranormal as showing that the possibilities are there in nature for these things. This hunch is perfectly sensible: if there are *weird, conceptually unresolvable things going on in physics,* and *weird, conceptually unresolvable things going on in a realm of experience*, then you must suspect that these are related. Some open-minded physicists have looked in this direction.[iv] But physicists have not been able to complete their theory in its own terms – they have not been able to specify the *physics* of the hyper-dimensional model successfully, so no one can tell whether there is a real connection with *spiritualist or psi or traditional metaphysics*.

The Aethereal Universe shows that *when a unified theory of physics is actually obtained,* it validates many such metaphysical concepts. It confirms the existence of metaphysical realities currently rejected by materialist scientists – and also rejects various metaphysical substances conjectured by materialist scientists. It represents a genuine *scientific reply* to the materialists' attacks on metaphysics and alternative conceptions of science. Most immediately, it validates the concept, personal to us all, that we have a soul, spirit, or personal identity that transcends our physical identity. It provides a *naturalistic* setting in which to interpret spiritualistic metaphysics.

TAU still does not show what consciousness is, it can merely assume the aethereal form is infused with consciousness or mind. It cannot show what *God* is, it can merely point to holistic realities we associate with such powers, and say that the question is real. It does not show what *time* is, it takes existence as fundamentally temporal. But this is going into 'deeper metaphysics', of ultimate causes, and the nature of Being, and the infinity of Time. TAU stops short of postulating anything to explain itself. In terms of ultimate metaphysics, it may also lead to the circular paradoxes of 'artificial reality' models. Its model is so mathematically simple that it is possible to make it the rule-base for a digitally simulated world, and we are left with the alternative explanation that we are living in an artificial reality.[v] This deep conundrum, questioning the fundamental reality of everything, akin to solipsism, cannot be answered here.

The term *metaphysics* is used in a general way here, for claims of higher degrees of generality than 'facts' or 'physical laws'. For instance, "*All the laws of physics are invariant under the Lorentz transformation"* is the common expression of *Einstein's Principle of Relativity*, adopted as the most fundamental principle of modern physics. This is not a specific *law of physics,* it is a 'meta-physical law', and a commandment that *<u>any future laws in physics must have this property</u>* (called *relativistic covariance*). Once we realise this, it is clear that modern physics is based on a metaphysical theory. That is not necessarily a criticism - every theory of physics is underpinned by metaphysics! The fallacy is to think that this particular metaphysical principle as been *conclusively proven by empirical science.* It is also a fallacy to think that 'metaphysical' means 'meaningless' or 'non-scientific' or 'unverifiable'. That is a slur on metaphysics propagated by positivists in the 1920's and 30's. Metaphysics, metaphysical reasoning, is all around us, in science and real life. Materialist

philosophy is especially hypocritical in this respect, being the most stridently metaphysical theory of all, while deriding any alternative metaphysics.

If we leave the 'principle of relativity' in the form above, then it is obvious it is metaphysical – and its 'metaphysical' character was openly debated and acknowledged as such by Einstein himself. The philosophers managed to hide this dependence by transferring it to an *object:* the *space-time manifold.* And by simultaneously imposing a *mathematical language for physics (relativistic tensor calculus)* that *only allows us to describe things in a space-time manifold.* If someone claims to develop a law of physics that is not 'covariant' then the physicists will infer that *therefore it cannot be modelled in the space-time manifold.* This 'manifold' is a mathematical construction of course, designed to encode equations, but physics has convinced itself that *it is a real object that physics has discovered.* It is really a metaphysical explanation for the law-like regularity expressed by the principle of relativity. This is seen clearly when it is considered in a theory (TAU) that gives an *alternative explanation* for the same law-like regularity.

However I do not want to discuss the academic debate here. Instead, I summarise the two main sides of the debate in present times by opposing the two paradigmatic views, dubbed the 'particles-in-a-box universe' and 'the Aethereal Universe'. These are contrasted with a list of general characteristics at the end.

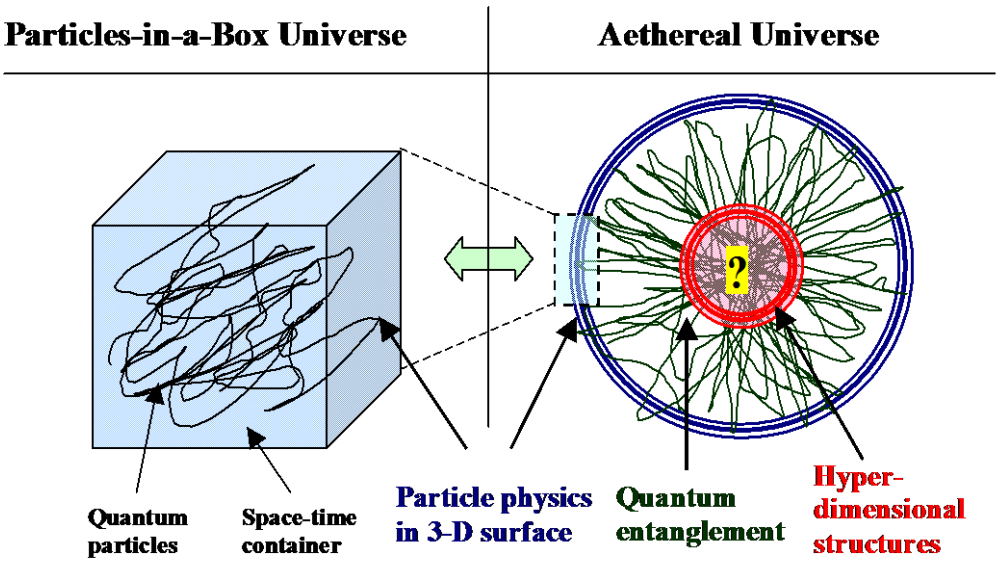
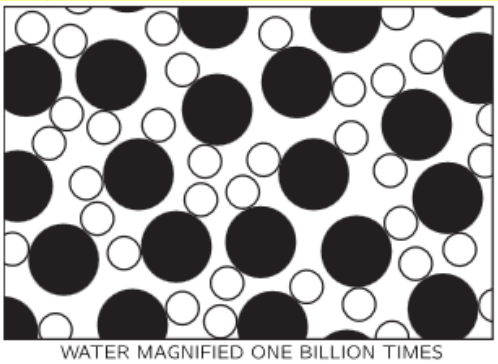


Figure 1.

These are the two paradigmatic metaphysical views to be contrasted here. The famous "Feynmann Lectures in Physics" starts with a classic encapsulation of the 'particles in a box' view. The physics of TAU *allows metaphysics it put forward its evidence*. We can state the controversy that TAU poses quite simply. There are two diametrically opposed metaphysical views - *materialism* and *spiritualism*. Both are possibilities from *physics* alone – without taking note of any content of our experience. To decide this dispute, we have to interpret the *empirical and experiential content of our world through the eyes of our ontological theory*. Physics is consistent with a universe devoid of life. But actually we know there is life, and we use this extra fact in our *realist* world view.

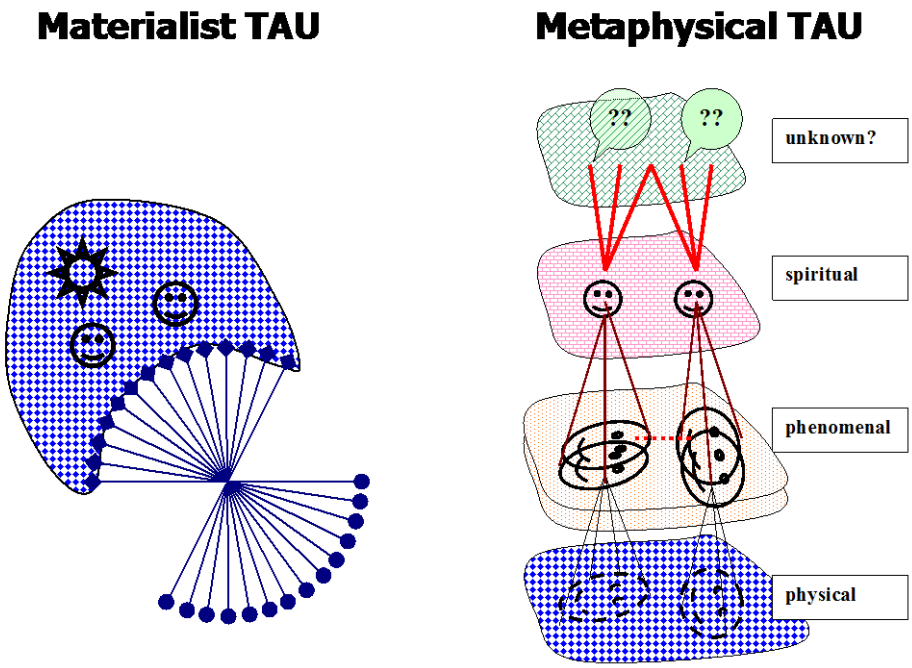
Particles in a box.

"If, in some cataclysm, all of scientific knowledge were to be destroyed, and only one sentence passed on to the next generations of creatures, what statement would contain the most information in the fewest words? I believe it is the *atomic hypothesis* (or the atomic *fact*, or whatever you wish to call it) that *all things are made of atoms—little particles that move around in perpetual motion, attracting each other when they are a little distance apart, but repelling upon being squeezed into one another*." Richard Feynmann, 1963. *Lectures on physics*, Section 1.2.
http://www.feynmanlectures.caltech.edu/I_01.html#Ch1-S1



WATER MAGNIFIED ONE BILLION TIMES

Figure 1–1



Materialist TAU says that *although it is possible for there to be deeper causality, there is only surface causality,* meaning that everything is driven by the *laws of the particle intersections on the surface. Reductionism, purposelessness, mechanical evolutionary from random origins, nihilism, atheism, are all retained in the world view.*

Metaphysical TAU says that *there really is deeper causality.* Meaning that *information, design, purpose, intelligence, life,* are inherent in deeper structures of TAU. There must be at least four or five 'ordered structures' to account simply for our 'folk concepts', of the *physical, phenomenological, spiritual, super-natural, divine.*

Figure 3.

Although we still have this confrontation between two world views at the deeper level of *existential* metaphysics, the issues are more transparent. TAU is a universe that is a natural host for the metaphysical concepts, so their *evidence can be evaluated without the a priori assumption that they are wrong before we start.* The materialists of course want us to evaluate our metaphysical world view from within their (*materialist particles-in-a-box) concept of physics.* We can ask that they evaluate their metaphysical world view from within *our concept of physics.*

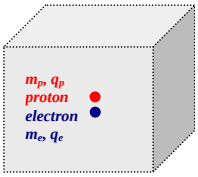
The following summary list contrasts the Aethereal Universe with the conventional 'particles-in-a-box' metaphysics on key points of difference.

SUMMARY OF TWO PARADIGMS	
PARTICLES-IN-A-BOX	THE AETHEREAL UNIVERSE
Physical Ontology	
Container = space-time (STR, GTR)	**Aether = 6-D manifold**
Particles = quantum fields	**Particles = wave-string structures**
Forces = particle exchanges	**QM Particles = strings**
Particles-wave duality	**QM Waves = surface perturbations**
Dimensions = 3 space + 1 time	**Dimensions = 6 space**
Physical Principles	
Space-time metric is fundamental	**Space-time metric is derived**
Space is relational	**Space is absolute**
Time is relational	**Time is absolute**
Simultaneity relations do not exist	**Simultaneity relations do exist**
Laws of physics are reversible	**Laws of physics are irreversible**
Quantisation is fundamental	**Quantisation is derived**
QM wave collapse is undescribed	**Wave collapse is described**
QM wave function is non-physical	**QM wave function is physical**
Physical Explanations	
Local constants are static	**Local constants change**
Local constants independent of global	**Local constants related to global**
Local gravity is exactly GTR	**Local gravity is approximately GTR**
Universe is 13.8 b.y. old	**Universe is 32 b.y. old, appears 13.8**
Gravity is constant	**Gravity appears decreasing**
Dark matter, dark energy, are substances	**Dark substances are artefacts**
Protons are not fundamental particles	**Protons are fundamental particles**
Quarks are fundamental particles	**Quarks are component waves**

SUMMARY OF TWO PARADIGMS	
PARTICLES-IN-A-BOX	THE AETHEREAL UNIVERSE
Causality and Information	
Causality is local in 3-D processes	**Causality is locally connected in 6-D**
Causality is non-local in wave collapse	**Causation is non-local in 3-D**
Information is only in particle states	**Information is in hyper-dim structure**
Information is distributed locally in 3-D	**Information is distributed non-locally**
Signalling is local in 3-D	**Non-local signalling possible**
Transport is local in 3-D	**Non-local transport possible**
Reductionism and Holism	
Reduction of all objects to particles	**Emergent levels of holistic objects**
Order evolved from randomness	**Physical order projected from center**
Life is a mechanical process	**Life is more than mechanical**
The universe is a mechanism	**The universe is like a living organism**
The universe is not conscious	**The universe is conscious**
The universe is not designed	**The universe is designed**
Personal and Spiritual	
Personal id is by 3-D physical body	**Personal id is hyper-dim objects**
Spiritual identity is impossible	**Spiritual identity is real**
Consciousness is physical	**Consciousness not physical**
Introspection is non-scientific	**Introspection is valid knowledge**
Meditation is psychological	**Meditation is a form of knowledge**
Metaphysics is nonsense	**Metaphysics is real**
Aesthetics is accidental	**Aesthetics is real**
Philosophical and Ideological	
Materialist substances	**Realist substances**
Positivist semantics	**Realist semantics**
Empiricist epistemology	**Realist epistemology**
Reductionist metaphysics	**Realist metaphysics**
Nihilist ethics	**Realist values**
Scientistic ideology	**Realist philosophy**

Table 1. Comparison of the two paradigms.

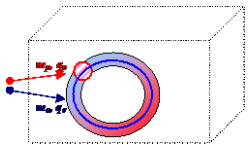
PART 1. THE PHYSICS OF TAU



I will introduce the physical model for TAU in 4 steps, iconised as follows.

(0) Start with two local particles, an electron and a proton, in ordinary space or space-time – conventional physics.

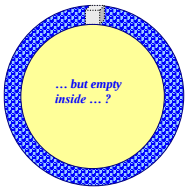
The first stage of the model produces the *STR metric, QM wave properties, and the electromagnetic force and gravitational forces*:



(1) Introduce the local 6-D particle manifold.

- *6-D Manifold → {STR + QM + GTR*}*
- *local forces are determined by manifold symmetry*

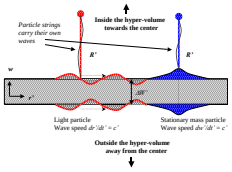
The second stage produces the *cosmological model, dynamic constants, expansion fundction of the universe:*



(2) Add the 4-D global hypersphere.

- *Cosmology → {W_R, W_e, W_p} ≡ {c,h,G,m_e,m_p,q_e,μ_0}*
- *local constants determined by global spatial variables*

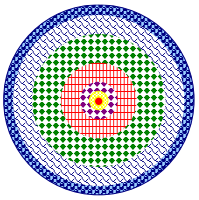
The third stage produces the *underlying mechanisms for quantum mechanical particles and entanglements:*



(3) Add the string entanglements within.

- *Completeness → $\Phi(\mathbf{r}) = \Phi^R(-\mathbf{r})$*
- *particle entanglements turn into larger internal object network*

(4) Combine these to obtain the *Aethereal Universe.*



- *The particle universe of physics is only the surface of the full Aethereal Universe*
- *There are no particles embedded in the aether, they are wave motions or shapes of aether*
- *Internal structures (strings) causally connect TAU across the global scale, almost simultaneously*
- *Internal structures are multi-dimensional forms, shapes, harmonics, etc*
- *Internal structures may carry information, memory, intelligence.*

These steps are put together in the following illustration.

1. The Aethereal Universe, starting from particle physics.

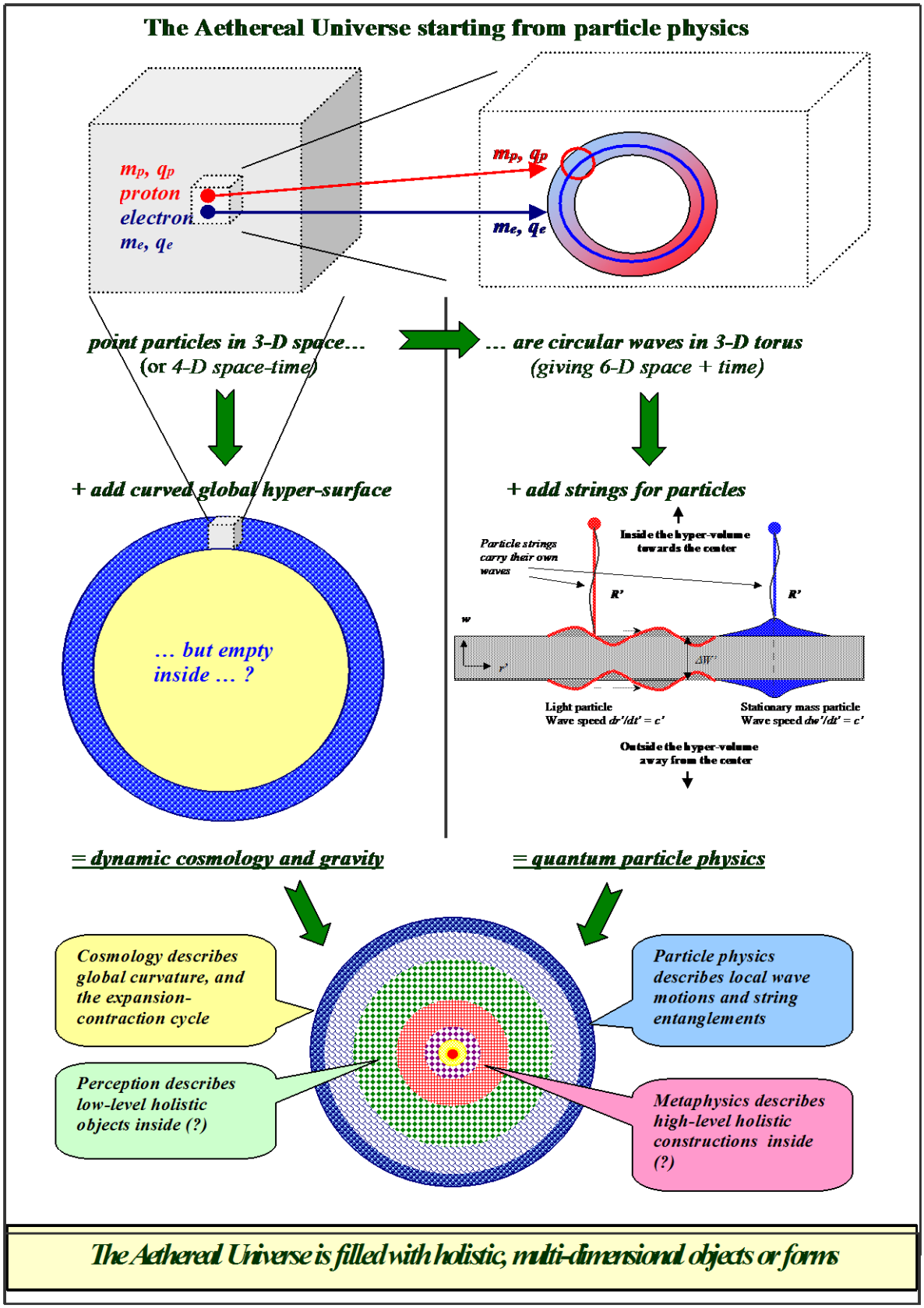
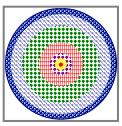
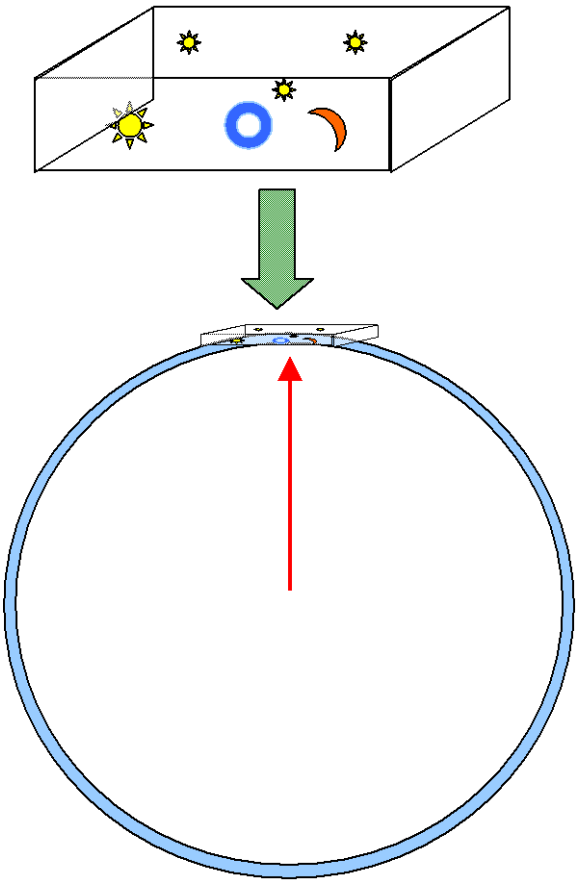


Figure 4.

1.1 Overview 1: TAU on the cosmic scale.



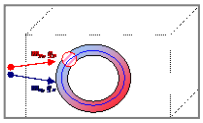
On the large scale, TAU starts as a *hyper-spherical universe, in four dimensions.* The first fundamental idea is that our space is *curved* on a cosmic scale. If we start with our ordinary three dimensional space, we have to imagine it curving into a 'sphere', exactly like a balloon, but in four dimensions.



Locally, say on the scale of our galaxy (about 100,000 *l.y.* which is only about *1/100,000th* the scale of the universe), a 3-D volume of space seems 'flat' to us. But just like the Ant on the Balloon, if we look across our whole cosmos, we find our space curves in a circle.

Figure 5. This shows our physical space as a thin (blue) shell, forming the physical cosmos. *Particles only exist in this shell of physical space (*which is the first part of the *aether).* Its *center* is outside 'physical space'. Particles cannot possibly travel to the center, any more than pixels on a TV can travel outside the surface of their screen. *Particles* are modelled as 'vibrations' or waves in the surface of physical space – the hyper-sphere. The *space of physics* is no longer the *whole universe* – it has extended to a hyper-dimensional manifold. Note that conventional cosmology allows the same effect (curved, closed manifold), but it does not introduce a new, 'external direction' to make the curvature 'extrinsic', as in TAU. In standard (GTR) space-time models, curvature is taken to be 'intrinsic', by using a way to work mathematically with variables defined *only on the surface,* and never referring to the larger 'empty space'. But it is equally consistent to think of curvature as *extrinsic*, defined in a larger space. And *not referring to something* doesn't mean it isn't there! And rather than being 'empty Euclidean space', it must be filled with structures!

1.2 Overview 2. TAU on the microscopic scale.



Before cosmology, TAU began with a multi-dimensional model for particle physics, but the two go intimately hand-in-hand. If we take the *cosmic hyper-sphere* to be a purely 3-D surface, (as the surface of a balloon is a 2-D surface), then the only *waves* parallel this surface travel in 3-D space. A basic principle of TAU is that *all waves travel at the same local speed,* which we identify as the local speed of light, *c.* The 3-D surface waves are therefore *light waves*. But we also need *mass particles,* primarily the *electron* and the *proton* as the two primary elementary particles. However, *these* can't travel at the speed of light, can they?! They are *relativistic particles,* and we have not made our manifold *relativistic*. How do we get *mass particles* and *relativity* into our aether?! This is the secret of TAU.

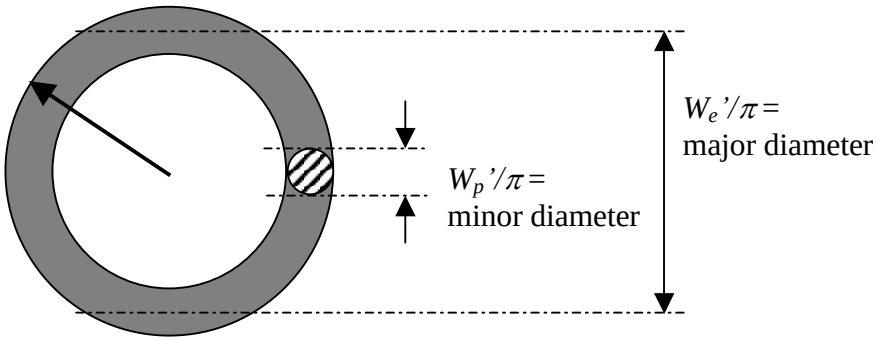


Figure 6.

We construct particles in the manifold by adding a tiny locally-curved *surface,* a *torus,* in extra dimensions, on a microscopic scale. We can see the idea from the 'balloon' model. Made of real rubber, the balloon skin stretches very thin, but still has a thickness. Its outer surface may be defined as a 2-D *geometric surface,* but the *physical manifold of the balloon* itself is a three dimensional substance. Now waves in the balloon can travel in the *surface* (2 directions), but can also vibrate *between the surfaces,* bouncing back and forwards. Although it looks two-dimensional to the Ant, there is really a third degree of freedom of wave motion – because there is *really a third dimension of manifold*. Instead of a one-dimensional 'thickness' (as with the skin of the balloon) to provide another dimension, TAU has a *torus surface* at every point of ordinary space. A torus has a two-dimensional surface, with a three-dimensional manifold. This creates a 5-dimensional manifold surface – our ordinary *3-D space ✗ 2-D* torus surface. It is embedded in a 6-dimensional space.[vi]

1.3 Overview 3. TAU on the inside.

Wave perturbations in the surface correspond *exactly* to relativistic quantum mechanical waves – shown by the fact that they have the same basic mathematical equation, the Kelin-Gordon equation. However there is still something missing: what individuates particles *as individual particles?* Why are particles *coherent?* What makes quantum particle waves 'collapse'? What represents *quantum entanglement?* And also, what happens to the wave perturbation at the center of the particle, where the *strain function* (local stretching of space) required for gravity appears to become infinite, and would normally be like an 'event horizon' or 'black hole'?

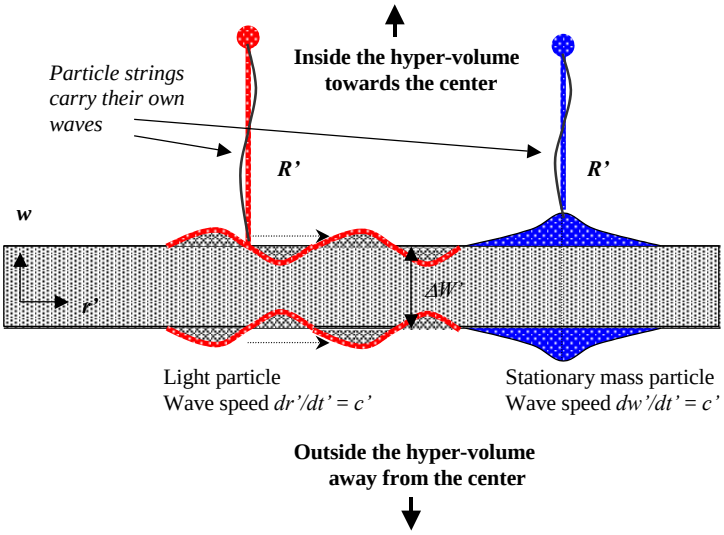
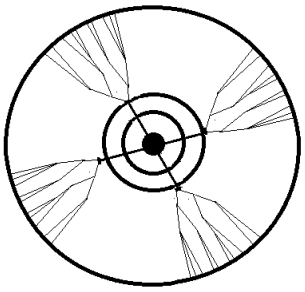
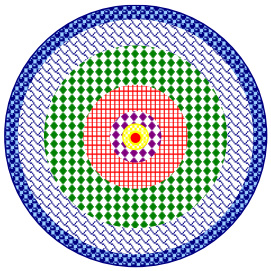


Figure 7.

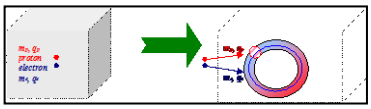
TAU postulates that *particle waves on the surface extend (or extrude) into extremely thin 'stings' of aether, that cross through the center and join to an identical reflected particle on the opposite side.* This is what individuates particles, and entanglement of the *strings* is what creates entangled quantum particle states. The strings have a key role in completing the physical 'mechanism'. But on the large scale, our hyper-sphere is now criss-crossed inside with *strings.* These carry harmonic waves, just like the particle waves on the hyper-surface. Because the strings are so thin, the wave speed in them is much greater. Waves in the strings cross the universe and back with the same period as the *particle wave on the surface,* which is about 10^{-20} seconds.





Strings match with quantum mechanics at the *surface,* and *particle creation* and *quantum entanglement* shows us how they must interact and merge at the lowest levels. But what is happening deeper inside the hyper-sphere? The second icon of TAU is meant to reflect that there is an unknown complexity of internal structure.

2. STR from extra circular dimensions.



The next two sections explain the first step in some detail. The model is based on a *mathematical equivalence*, which is worth understanding if you want a clear visualisation of the particle-level physics.

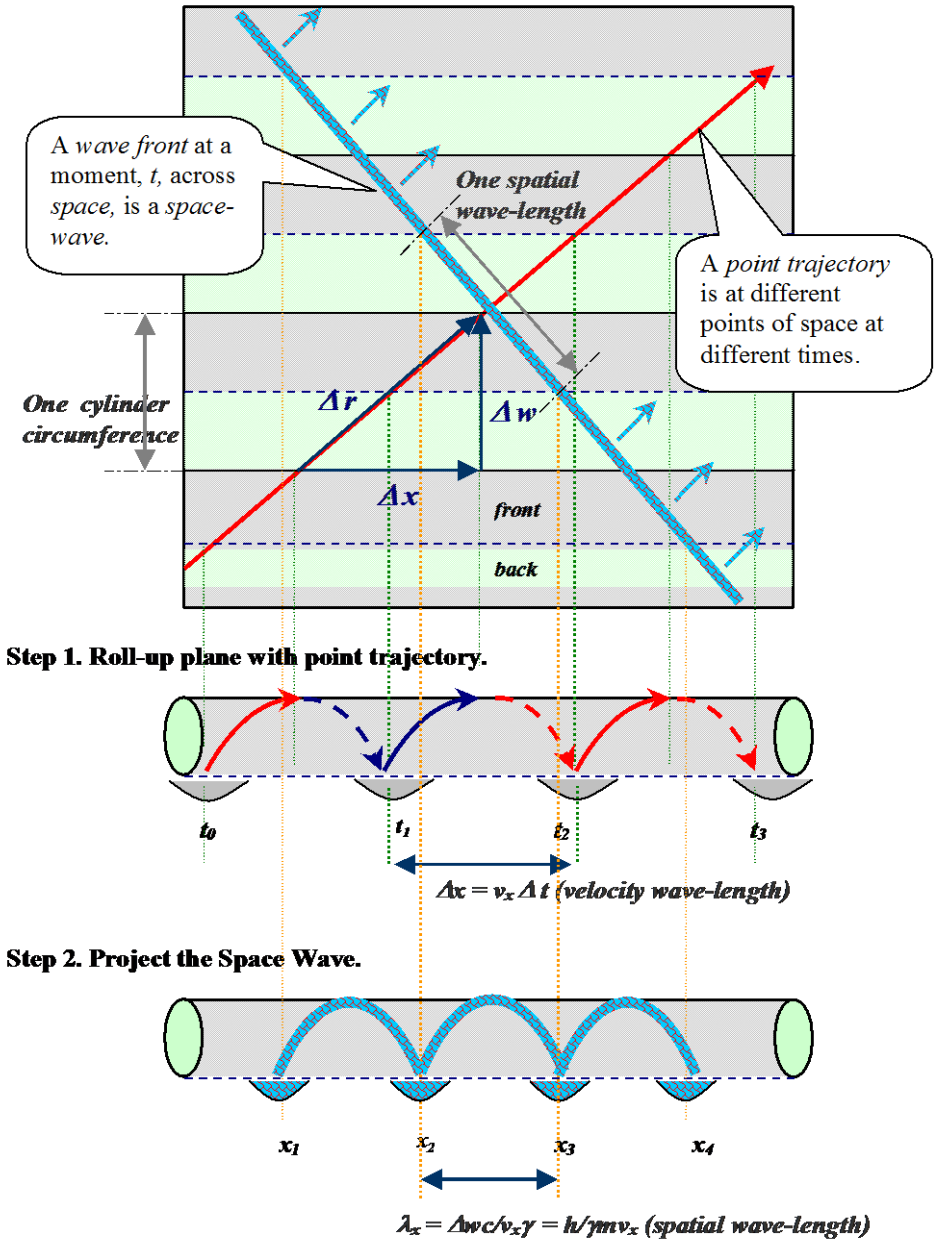


Figure 8.

2.1 STR from simple maths.

Take a flat piece of paper (plane), mark one direction as Δx, and the perpendicular direction as Δw. Δx and Δw are unit vectors of the same length.
Mark the plane with horizontal strips, Δw high.
Then draw a straight line (red) across the plane, in a random direction.
This represents the path of a particle moving at a universal speed, c.
We assume it moves a total distance Δr in a period Δt.
Now work out the components of motion in the two directions.

(1) $\Delta r^2 = \Delta x^2 + \Delta w^2$ [Pythagoras' theorem]

(2) $\Delta r/\Delta t = c$ [Universal wave-particle speed c]

(3) $v_x = \Delta x/\Delta t$ [Define speed in the x-direction]

(4) $v_w = \Delta w/\Delta t$ [Define speed in the w-direction]

(5) $c^2 = v_x^2 + v_w^2$ [The velocity components]

We now roll the sheet of paper up into a cylinder, parallel to x, with circumference Δw. The straight line trajectory we drew is now a spiral around the cylinder. It completes a *revolution of the cylinder* when it travels Δw in the *w direction.* This circular motion gives it properties of having a *frequency* and a *period* and a *wave-length in the x-direction.*

(6) $T = \Delta w/v_w$ [Time to move Δw at speed v_w]

(7) $f = 1/T = v_w/\Delta w$ [Revolutions per unit time]

(8) $\lambda = v_x T = \Delta w\, v_x/v_w$ [Distance in x each revolution]

We now think of this motion as representing a *physical clock*, having a periodic process. We will call it a *process clock.* We will define the quantity of *time* it measures, called *process time (or proper time),* with a variable usually written as the Greek *Tau*, or τ. We will *define* τ as periodic motion in w, by the definition:

(9) $\Delta\tau = \Delta w/c$ [Define $\Delta\tau$ from Δw and c]

So far, this is a simple piece of *preliminary classical physics (or geometry)* – but we will now see that it represents the special relativistic metric and Lorentz transformations and relativistic QM particle properties all in one go. We don't add anything to it, we just look at it in a slightly different way. First, use (9) to replace Δw with $c\Delta\tau$ and (2) to replace Δr with $c\Delta t$ in (1) and we have:

(10) $c^2\Delta t^2 = \Delta x^2 + c^2\Delta\tau^2$ [Rearrange equations 1, 2, 9]
[speed] [time] [space]

This is the metric equation of Special Relativity (Minkowski) space-time, where it is rearranged with *process time* on the left:

(11) $c^2\Delta\tau^2 = c^2\Delta t^2 - \Delta x^2$ [STR Metric Rearrange equation 10]
[speed] [proper-time] [space-time]

The R.H.S: $c^2\Delta t^2 - \Delta x^2$ is sometimes referred to as *the STR metric.* It is interpreted as a *length (or interval) in space-time.* This rearrangement of (10) to (11) corresponds to the *tensorial interpretation,* with *invariant quantities.* In the physical situation, the measurement of $\Delta\tau$ is invariant or absolute, like the count of rotations around the cylinder, so the metric is fixed at every point.

However, physics has *moving observers* in space, who set up *moving coordinate systems for space* relative to us. What the form (11) shows is that if a moving observer sets up a new set of space-time variables, call them: (x', t'), it must leave: $\tau' = \tau$ invariant, so: $c^2\Delta t'^2 - \Delta x'^2$ has to be invariant:

(12) $c^2\Delta t^2 - \Delta x^2 = c^2\Delta t'^2 - \Delta x'^2$ [STR relation between variable systems]

The *Lorentz transformations* are the set of (linear) transformation functions from: (x,t) → (x',t'), that preserve this quantity, the *'space-time interval',* when we transform from one coordinate system to another. They can be interpreted 'epistemically', like Einstein, as the coordinate transformations that represent a uniformly moving *(x',t')-coordinate system,* and retain the form of (2), the universal speed postulate, in the new coordinate system. But Einstein and Minkowski took the *metric as expressed in (11)*

as a fundamental and unanalysable property of 'space-time'. This metaphysical substance became (after generalisation to GTR) the key substance in C20th physics, the new 'box' that holds the 'particles'. But they left proper time, $\Delta\tau$, *physically uninterpreted in detail.* Its interpretation in STR is by the (second-order) 'Principle of Relativity', that *any laws that determine proper-time, τ, must conform to the metric (11),* meaning they must be invariant w.r.t. the Lorentz transformations too. In our 'rolled-up-space' model, the STR metric (11) is derived from the *speed equation*, (10), and interpreted and explained by the simple Euclidean geometry. We see next that *this forces us to interpret τ,* but first I add the definition of energy.

To complete the basic STR relations for mass-energy, assuming we are modelling a fundamental particle with rest-mass m_0, and total mass m, we define *total energy* for motion in the original plane as *kinetic energy*:

(13) $E = mc^2$ [Define Energy]

This has two components, in x and w:

(14) $E = mv_x^2 + mv_w^2$

Kinetic energy + Rest-mass energy

From the definition of v_w it is useful to define the quantity γ:

(15) $\gamma = c/v_w$ [Define Speed Ratio]

Note this is identical to the conventional *Lorentz Factor*: $\gamma = 1/\sqrt{(1-v_x^2/c^2)}$, by substitution. If we take a *stationary particle in x* to have rest-mass m_0, we can write:

(16) $E_0 = m_0c^2$ [Define Rest Energy]

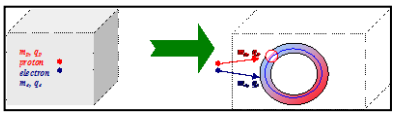
Then for Lorentz invariance we must define energy generally as:

(17) $E = \gamma E_0 = \gamma m_0c^2$ [Define Energy]

And with (13), this entails mass dilation:

(18) $m = \gamma m_0$ [Define Rest Energy]

3. QM from extra circular dimensions.



The *proper time*, $\Delta\tau$, physically uninterpreted in *STR*, could only be interpreted in detail when QM particle physics was discovered. We now see how the *cylinder model forces the interpretation of* $\Delta\tau$, and gives rise to quantum particle-wave properties, just as simply and naturally as it gives rise to the STR metric. If we can imagine that each point in 3-D space *actually has a circular dimension attached*, we can use this as a physical model to generate a particle theory.

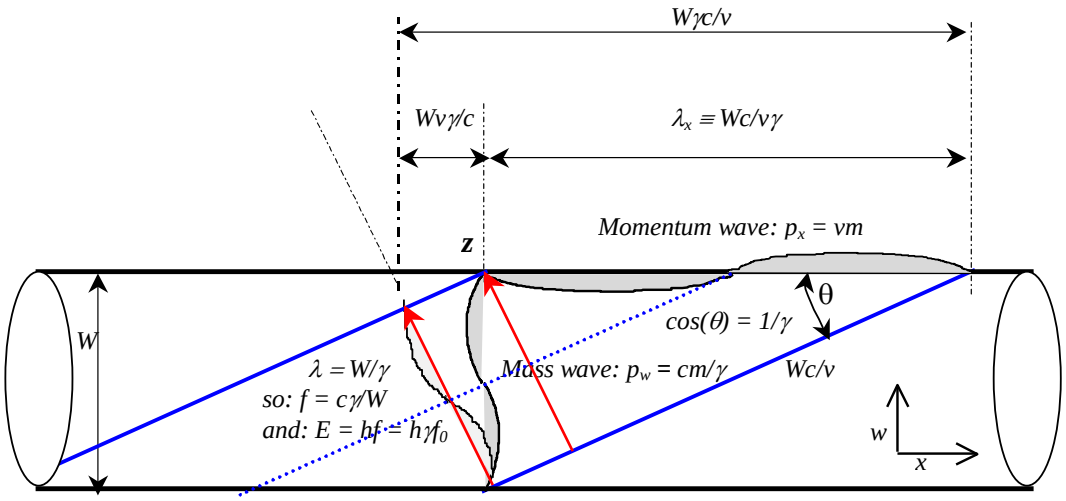


Figure 9.

Geometry of the plane-wave motion across the cylinder.

The following mathematical derivation is illustrated in this diagram. It means that this simple model does two things at once: it *reproduces the relativistic STR metric*, and simultaneously *generates wave-like motion with quantum mechanical properties of real particles.* This is all from a manifold without any intrinsic relativistic space-time properties or quantum properties.

3.1 QM from simple maths.

In this model, radiation and mass waves are both wave perturbations travelling at the local speed *c*,, light is simply perpendicular to the *W-directions,* rest-mass is parallel to the *W-directions*. We postulate that the *mass energy equals the wave energy.*

(19) $E = \gamma m_0 c^2 = hf$ [Equivalence Postulate, energy law for light]

Since: $f = c/\Delta w$ for a stationary particle, this means:

(20) $m_0 c^2 = hc/\Delta w$

This determines the new *circumference,* Δw, for a particle with rest-mass m_0.

(21) $\Delta w = h/m_0 c$ [Postulate of Δw for particle m_0]

The *spatial wavelength* is the apparent wave-length around the cylinder of a *plane wave-front,* perpendicular to the direction of motion. From the geometry, because the *wave front is perpendicular to the motion in the plane:*

(22) $\lambda_x/\Delta w = (\Delta r/\Delta x)(\Delta w/\Delta r)$ [Geometry: similar triangles, rotated 90 degrees]

Using: $\Delta x = v_x \Delta t$ and: $\Delta r/\Delta t = c$ and and: $\Delta r/\Delta w = \gamma$ and rearranging:

(23) $\lambda_x = \Delta w \Delta r/\gamma v_x \Delta t = \Delta w\, c/\gamma v_x$

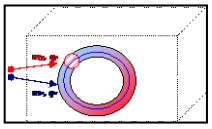
Using (21) for Δw*:*

(24) $\lambda_x = (h/m_0 c)(c/\gamma v_x) = h/\gamma m_0 v_x = h/m v_x$

This is the *de Broglie* wave-length for a 'matter wave'. This 'mass-wave' is also spinning in a *circle,* so it should have an 'intrinsic' angular momentum of *V x M x R,* which turns out to be an invariant quantity (w.r.t. *mass*), the QM intrinsic spin[vii]:

(25) $\boldsymbol{L} = c\, m\, (\Delta w/2\pi) = h/2\pi$ [Intrinsic angular momentum predicted]

4. The Torus



We can't go around introducing a new spatial dimension for every mass. The Aethereal Universe uses a *torus*, to model two fundamental mass-particles, the *proton* and *electron*, and derives other particles as complex wave-modes. This means adding *three dimensions of space*, giving six in total. The *particle waves* are distortions or perturbations of a 5-dimensional surface.

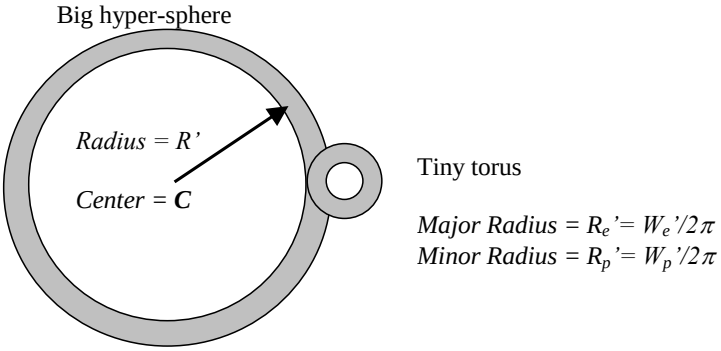


Figure 10.

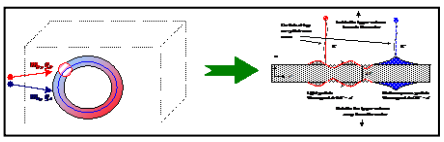
This shows TAU on a cosmic-scale as a *hyper-sphere* (our normal *x, y, z* space, but curved into the large circle), with a tiny *torus* embedded at each point. The *torus* has three dimensions, with a two-dimensional surface, and it defines two *circles.* It is defined by two lengths, the major and minor radii or circumferences of its circles. These circles host two fundamental particle waves, for the *electron and the proton.* Note light particles or *photons* are surface waves, with only a circular polarisation.[viii]

This choice of the torus is needed to identify the correct form of the *cosmological volume equation*, the fundamental property of TAU. This says that *the total 6-D aether volume is constant.* The volume of the torus, as shown, is: $2\pi^2 R_p^2 R_e$, where R_e and R_p are the radii for the *electron* and *proton* 'circles', respectively. This determines *the combination of particle masses* in the relation required to predict:

(26) $T^* = h^2/2\pi^2 m_e m_p^2 Gc = 13.823$ *b.y.* [99.9% accurate against empirical 'age']

T^* predicts the conventionally measured age of the universe. Note that $h^2/2\pi^2 m_e m_p^2 G$ is purely *local constants*, but predicts the '*cosmological age'* of the universe.

5. Particle strings.



This already gives us a good particle model in terms of *perturbation waves in the surface*, but quantum particles have additional properties, including *being particles*, i.e. individuated. These emerge from the model as *strings.*

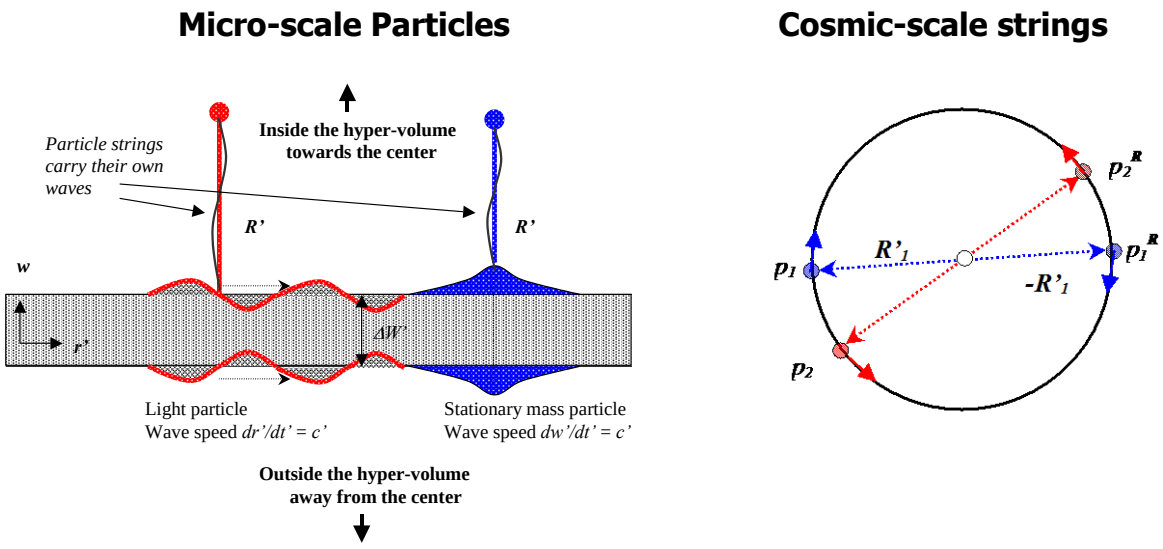
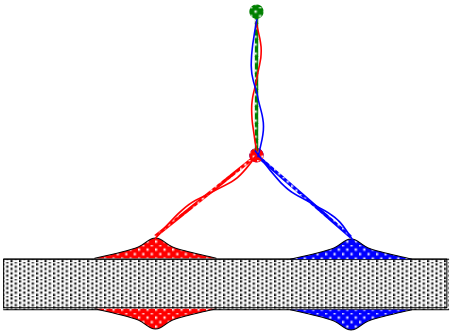


Figure 11.

Strings are very fine, thread-like filiments of aether, with the same cross-section as the GTR black-hole for a fundamental particle, but stretching *right across the inside of the universe*, to a paired anti-particle on the other side. We will see this after returning to the cosmological picture. But *strings* already have crucial functions in local QM, explaining the *individuation of particles*, the *coherence of the waves*, *particle entanglement* and related *wave function collapse*.



Particle strings are *entangled*, giving a physical for the 'entanglement' reflected in the QM wave functions.

5.1 Quantum entanglement.

It is worth getting a picture of *quantum entanglement,* because it is a very real feature of our physical world, measured and tested in the 1960's, and it is the central 'spooky' feature of quantum mechanics, as physicists often say. And as far as they know, these connections hold across any distance – across the whole universe. It involves both *causes acting at a distance (or non-local correlations),* and a *paradox of causal-temporal direction.* Take two electrons in an atomic orbit where they have opposite spin states, and separate them carefully, and measure the spin state of one particle, then the other particle will have the opposite spin *whenever its spin state is measured*. We can see how it behaves with this little 'mechanical model', which represents the two electrons as little 'clock faces' with spinning hands, *connected by a rod through space.*

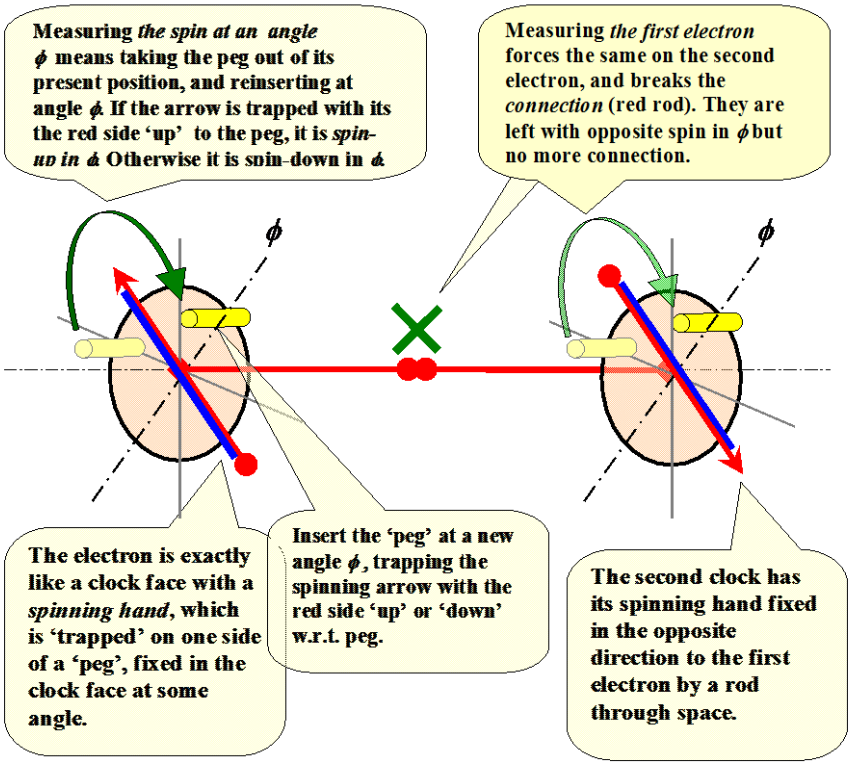


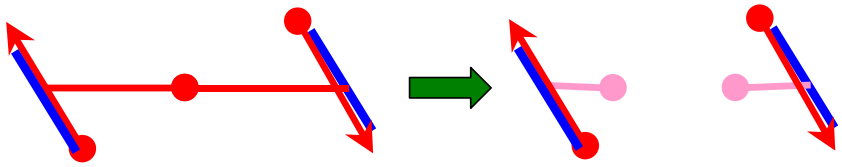
Figure 12.

This mechanical model captures *exactly how it behaves*[ix] – and *essential to its mechanism is the rod directly connecting two electrons through space to keep their 'spins' synchronised!* But it is impossible for conventional physics to allow this for two reasons: no one can see it anywhere in 3-D space; and it would *break the laws of relativity theory,* because it entails absolute simultaneity between distant events.

5.2 Quantum Entanglement mechanisms.

What puzzle scientists about this is that there is apparently no 'physical mechanism' possible for this instantaneous connection in nature across space. There are two types of explanations that occur. First, why can't the particles just have *fixed opposite properties of spin* before they are separated, to account for their later synchronisation? The fact that this connection *cannot* be modelled with 'static' or determinate properties is a major result of quantum physics in the 1960's, associated with Bohm, Bell, Aspect, making headway on issues raised by Einstein in 1935. It is due to the way quantum *statistics* work. You can choose different angles at which to sequentially measure the spins, and the results are inconsistent with models using *fixed properties.*[x] Given we can choose the *measurements to make* in the future, then different choices would give different predictions. It is represented in the 'clock' model by the fact that the probabilities generated from the *dynamic* spinning hand model cannot be matched by a *static* property model.[xi]

Second, why can't we have a *pre-synchronised* dynamic model, like the clock, but without maintaining a fixed connection? Because the result of second measurement *depends on the time it is measured at,* and we cannot determine this in advance.



Two particles in a singlet state are *directly connected across space,* so their spin-orientations are *instantaneously synchronised.* This is an *entangled state.*

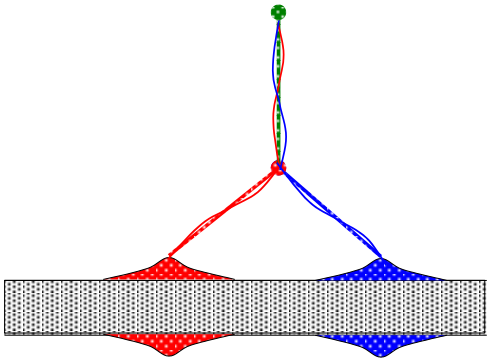
Once spin on either particle is *measured*, their *connection* breaks, and they act independently from then on. But they fixed in opposite states by the measurement.

Figure 13.

The only realistic option seems to be that *there is a direct causal connection between entangled particles that keeps them perfectly synchronised with each other,* until it is disturbed by a *measurement,* when it breaks. For this, we have to contradict *relativity theory* and maintain that *there is a real causal order involved,* and we have to *find a new dimension for the connection,* because it is not in ordinary 3-D space.

5.3 Quantum entanglement in TAU

Strings are combined *harmonically* when particles become entangled. The spin of the particle in TAU is caused by *real motion*, viz. circular waves in the torus, and this motion is carried in the string vibration, with the same period. Two electrons in a singlet state means that *their strings have joined in a single harmonic state.* They are forced into this state in atomic orbits, where they are forced very close together – in the helium atom they are forced as close as *the radii of microscopic dimension itself.* Electrons in this entangled state have to occupy opposite (distinct) wave-states. [xii] This means their strings are in exactly the opposite harmonic state. This is slightly different to the *mechanical model*, in that we now have a causal hub occurring *where the strings meet.*

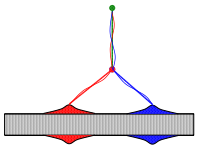


Particle strings are *entangled*, giving a physical for the 'entanglement' reflected in the QM wave functions.

What about simultaneity? In TAU, all particles are connected in a single frame of simultaneity, with super-luminal causation in the strings, it all works consistently, and there is no problem with simultaneity.

In conventional physics, this is a huge blind-spot, shown by the paradoxes physicists are forced into by these super-luminal connections. In relativity theory, there is supposed to be *no physical difference* between co-moving frames of reference, but two separated events can have one temporal order in one frame and the opposite temporal order in another. While there was no *causal influence* between distant points, this was odd but not paradoxical: two events simply *had no temporal order.* But once we have one event *instantaneously causing another distant event*, surely there has to be an absolute temporal order?

5.4 String entanglement.



Particles at a distance can act in QM as if they are correlated by some invisible force, connecting their properties. In TAU, they *are literally connected by strings*, that provide exactly the enhanced causal interconnectivity required to sustain a realist quantum model.

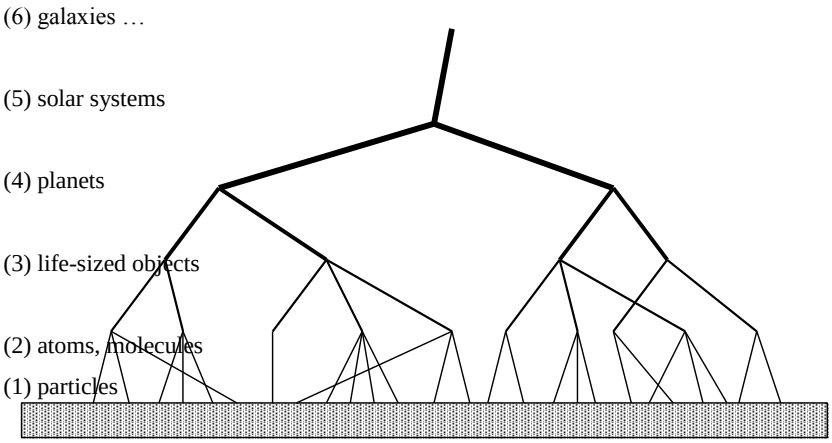
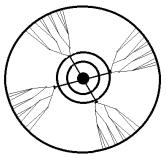


Figure 14.

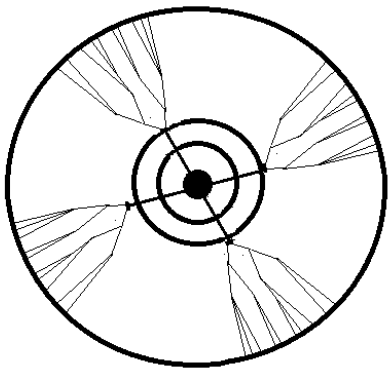
This is purely schematic, and illustrates the notion that the strings for (1) *fundamental individual particles* that impinge on the 3-D surface of space join into entangled states like (2) atoms or molecules, and on in increasing scale, to (3) life-sized objects (chairs, computers, brains …), then into (4) planet-sized objects (Moon, Earth), then into (5) solar-system sized objects, then (6) galaxies, and so on. Separation in 3-D space is no obstacle to entanglement, although entanglements are thought to be created by local interactions.

Every *join* of two strings creates an 'interface' that contains 'extra-physical' information that is *not reducible to the particle states taken separately*. This reflects the holistic nature of the quantum wave function. A quantum system with many particles is not reducible to its individual particle wave functions, in the way classical that materialist reductionism conceives physical objects to be reducible to their constituent atoms or 'smallest particles'. This reflects the common observation that the quantum system as a whole is not just the sum of it parts.

5.5 Entanglement in the whole universe.



On the large scale, TAU is a highly symmetric hyper-sphere, and strings from particles ultimately join across to twin particles on the opposite side of the universe. The *particle universe* has a perfect *reflection symmetry*: it is dualistic in the sense that every object has a dual reflection, and TAU is a perfect reflection of itself through its center. As strings merge in the center, string-bundles of larger-scale objects, such as galaxies, clusters of galaxies, super-clusters or 'walls' of galaxies, become entangled, and may merge into a single central hyper-surface.



This image is meant to illustrate the global reflection symmetry, and the fact that there must be structures inside the hyper-sphere that are beyond what we know of local entanglements. We have learnt from quantum mechanics that local entanglements occur, but what happens on the large scale? And what happens in the 'center of the universe', where all the strings should converge as they cross? What kinds of complex structures are inside? Is information exchanged inside the hyper-sphere? Are there other hyper-surfaces nested inside the large hyper-sphere?

Given that the string structures inside the hyper-volume represent essential information about the surface particles and determine their behaviour and interactions, it is clear that the universe contains more 'internal structure' than suspected from reductionist particle physics. The fact that information in the inner structures is 'projected' into the particle behaviour on the surface opens the door to any number of speculative possibilities about the source of causality in the world, the nature of information, and the existence of 'non-physical' entities. This is where we eventually cross from physics to metaphysics. But first we return to the cosmological model and global curvature.

6. Visualising multi-dimensional curvature.

First, take yourself in ordinary 3-D space, and extend a flat 2-D plane, horizontally, at waist height, in all directions. Where do you get to if you extend a path in front of you and jest keep going?

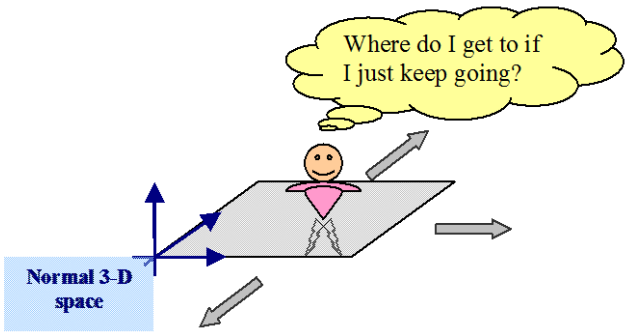


Figure 15

In most conventional models cosmology, if you 'froze the expansion of the universe' and traced a path through space, you would end up going in a circle and coming back to where you started from! However it is a mystery how space curves – since cosmology does not use extra dimensions of space, it claims it is 'intrinsic curvature'.

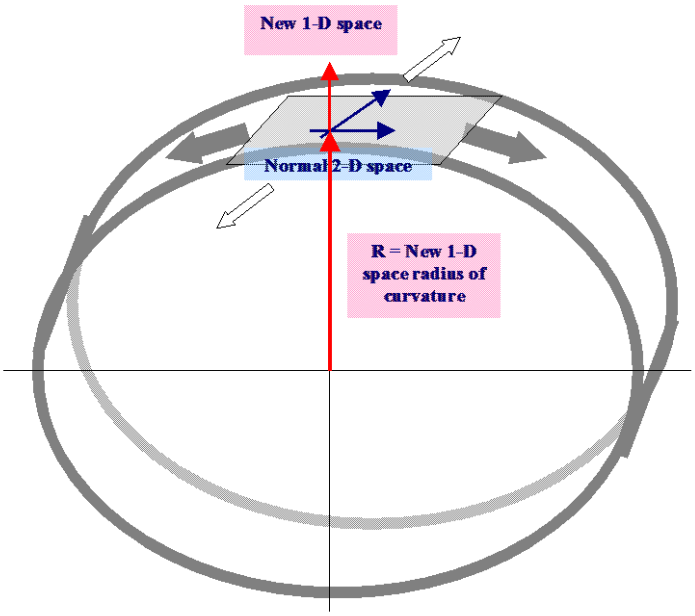


Figure 16

In the curved space of TAU, we find that the 'flat plane' surface we have defined *in real space* acts like the surface of a *real balloon* (on a very large scale)! Any direction we follow comes back to the starting point! It is curved with a radius $R = L/2\pi$, where L is the distance to complete a circle. And in TAU it is curving *in a real dimension.*

6.1 The extra dimension of space in cosmology.

The *curvature* of space as you travel cannot be happening in any dimension of normal space. As you walk along the strip, you might think that it is curving ever so slightly up or down or left or right in real space, and this makes it turn in a circle, but this is not so. The *curvature* is in a new *direction of space*. Physics has discovered there is a 'ghostly' dimension in which 3-D space curves like a balloon![xiii]

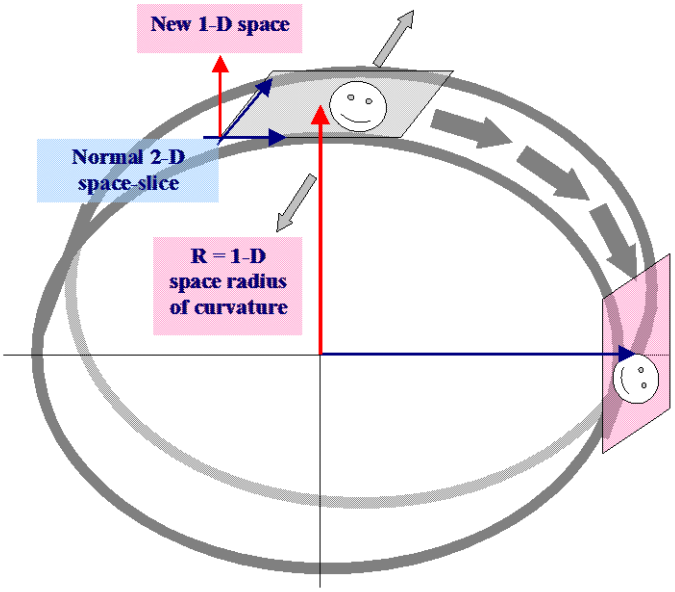


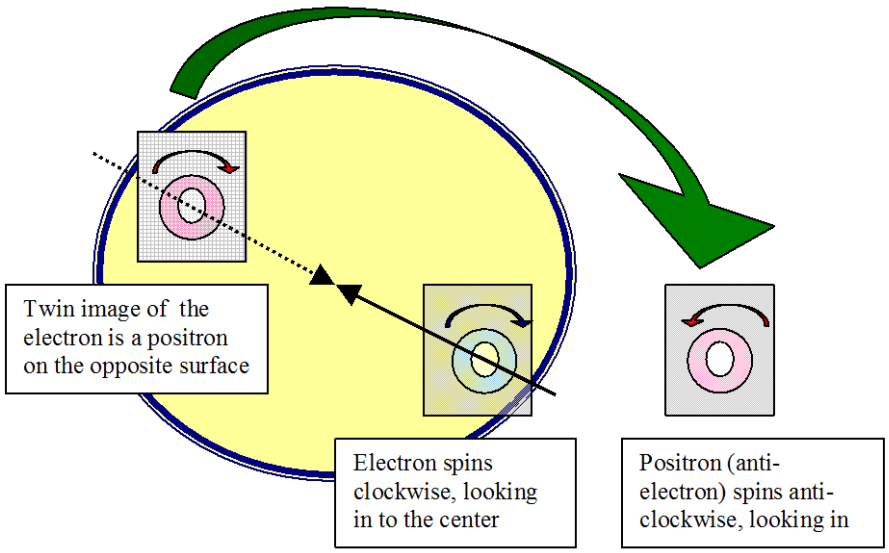
Figure 17

As you move forwards in 'a straight line', you are changing direction, because you eventually go in a circle, but how exactly? It is the *forwards direction vector* (i.e. the vector pointing straight ahead of you) that slowly changes. When you are ¼ way around the universe, your forwards direction vector will have rotated 90 degrees, into your original central *R* direction. Your sideways directions have not changed.

It is much like getting used to the concept of a spherical earth instead of a flat earth. Except we are now talking of a 'hyper-spherical universe'. You can go in a straight line in *any direction,* and you will come back in a circle to where you started. It will also be useful to think of moving *in a straight line on the surface* as really *moving in a pipe,* being directed by the invisible surfaces of the pipe without realising they are there. The pipe is curved into a very large hoop.

6.2 Unifying the cosmological and torus dimensions.

In TAU, at every point of ordinary space there is a *torus*, with three extra dimensions, and there is also a *unique direction to the center of the hyper-sphere.* This central direction must be one of the directions already present in the torus. We postulate that



Electron-Positron Twins

the central axis of the torus points towards the center of the hyper-sphere.

Figure 18.

The direction to the center is determined by the *string*, and gives rotations around the major circumference of the torus an *orientation*: clockwise or anti-clockwise relative to the direction looking in to the center. The orientation of spin corresponds to positive and negative electric charges, or particles and anti-particles.[xiv]

This model implies that *every matter galaxy in the universe has a mirror anti-matter galaxy!* No particle can encounter its own anti-matter image, but it can encounter other anti-matter. Anti-matter explosions must have dominated in the early universe, and there should still be occasional explosions. This relates to *cosmic voids, gamma ray bursts, UV light sources.* Modelling galaxy formation depends on models of granularity in the early universe, and has not been attempted yet, but some simple calculations from *mean path length* of particles in galactic and inter-galactic media confirms this as plausible: all anti-matter within matter galaxies should have long interacted, but a significant mixture should remain in intergalactic dust, and some

comet, planet, or even star-sized aggregations may survive outside galaxies, and occasionally impact, with a major GRB event.

7 Causality and Transmission of Information.

Causality in TAU is by *causal propagation of perturbations* of the aether, with *causal order determined with an absolute simultaneity.* The surface waves in 3-D space are constrained to move at the local speed of light, *c*, as in ordinary relativistic physics. However, waves in the *strings* move at a much greater speed, and 'bounce' back and forwards across the universe in the same time as the particle wave frequency (for an electron $\approx 10^{-12}$m /c $\approx 10^{-20}$ secs). Strings join together in harmonically synchronised wave motions, to create non-local effects of QM, or *entanglements*.

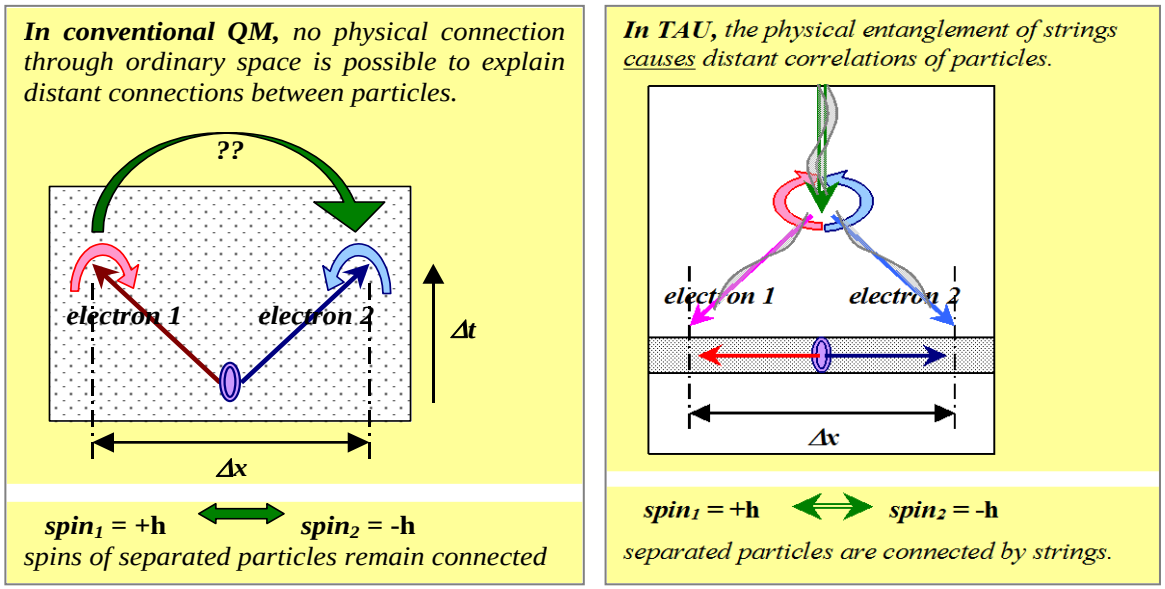


Figure 19

The diagram on the left shows a pair of electrons being separated in a singlet state, over a period of time. After they are separated (before their spin is measured), no apparent physical connection remains between them – but their spin behaviour remains correlated *as if they remained dynamically connected*[xv]. The diagram on the right shows the particles in TAU, at a moment of time, after being separated. In TAU, they remain *physically and causally connected by their string entanglements*, inside the hyper-sphere.

The non-local *correlations* are well established experimentally and theoretically. Particles behave as if they remain 'instantaneously' *connected* by some hidden mechanism. But there is no possible causal mechanism for a physical connection in conventional physics, because the influence would have to be propagated through ordinary space at a speed faster than light. It would require absolute simultaneity.

7.1 Central Causality means Non-Local Transmission Mechanisms.

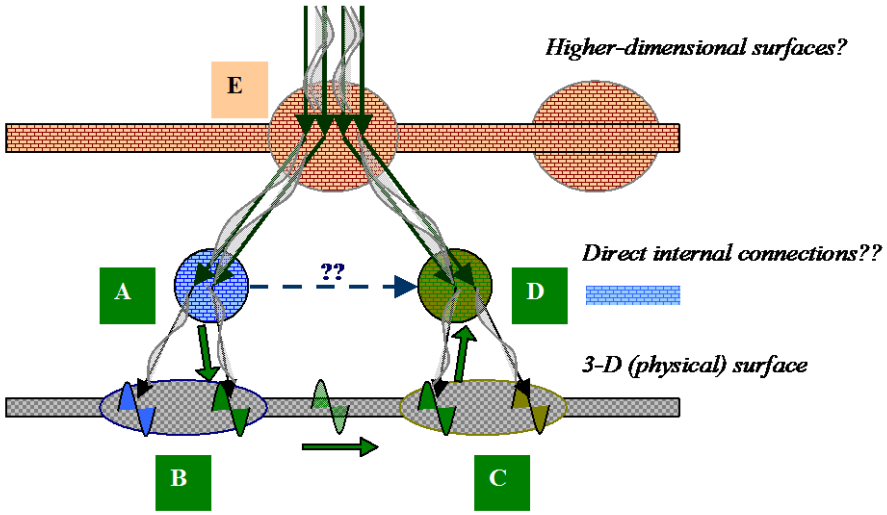
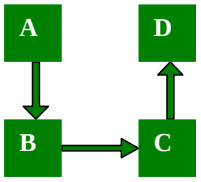


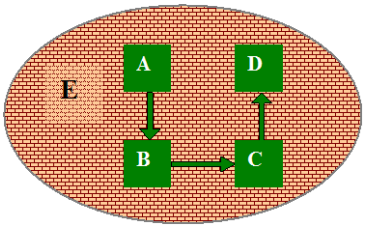
Figure 20.

To send a message (say with a flash-light) from one agent, (A), to another, (D), conventional physics demands that *the only route is*: *A → B → C → D,* i.e. *via the particle-complex,* (B), by sending a *part (particle) of (B)* across space *Δx*, at speed *c*, to impact a *part of* (C), the particle-complex for agent (D), who receives the message by being forced into an altered physical state.

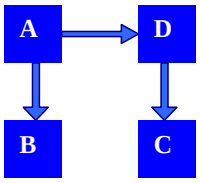
- The *conventional causal chain* is only through the *particle chain.*



With entangled strings however, there are more possibilities.



- First there are higher-level *holistic entangled strings* that contain the 'images' of the physical surface interactions in their internal states (the harmonics of strings). 'Intelligent agents' can plan to *amplify actions*.
- Second it is *possible* there are direct connections between higher-level objects, that may be used to *force causality in the opposite direction,* i.e. (A) causes a change in (B) directly, and this is *forced* into the physical object states.

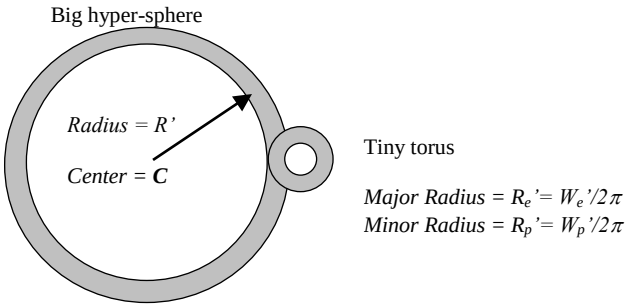


8. Unification of physical ontology.

There are only four quantities needed to specify the global state of TAU.

• R_U	*the universe radius*		
• R_e	*the torus major radius*	⟷	$\{c,h,G,m_e,m_p,q_e,\mu_0\}$
• R_p	*the torus minor radius*		
• dR_U/dt	*the rate of expansion*		

The global state of TAU must determine the local (background) state of the aether. But the local state is characterised by seven ordinary constants of physics: $\{c,h,G,m_e,m_p,q_e,\mu_0\}$. In the conventional theory, these are independent. So how do we derive these seven quantities from just four: $\{R_U, R_e, R_p, dR_U/dt\}$?



The natural assumption is that the aether itself will have some additional '*physical properties' or parameters,* which determine the *kind of universe we are in*, through the values of the physical constants. The conventional assumption is that the values of *c, h, G,* etc, are 'contingent' to our universe, with *different universes* having *different laws* due to *different constants*. But this is not true in TAU. *There are no other parameters or properties except shape and time to set the physical constants!* The relationships are seen by setting equivalences between *dimensionless quantities* [1].

[12.1] *Small Ratio equals ρ' (defined by: m_p'/m_e')*
$W_e'/W_p' = \rho' = m_p'/m_e'$

[12.2] *Large Ratio equals D' (defined by: $h'c'/m'^2G'$)*
$(2\pi R')/W' = D' = h'c'/m'^2G'$

[12.3] *Small Normalised Ratio equals $1/\alpha'$*
$(m_p'/m_e')^{2/3} = 2\varepsilon_0'h'c'/q'^2$

[12.3*] *Small Normalised Ratio equals $1/\alpha' + (dR'/dt')^2$*
$(m_p'/m_e')^{2/3} = 2\varepsilon_0'h'c'/q'^2 + (dR'/dt')^2$

I illustrate next with a simple argument using *scale symmetry* that shows how the *gravitational constant, G,* can be determined, giving rise to [12.2].

Gravity and local curvature.

The idea is simply that an energetic mass-wave in space has its mass-energy through 'stretching' space, as shown below.

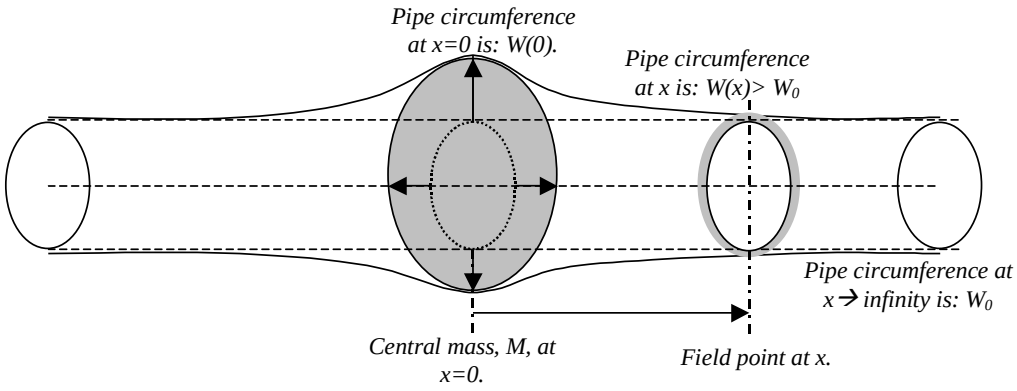


Figure 21.

Local gravitational curvature in the simple 'electron-pipe'.

The theory of gravity in the model is compelled by the fact that the mass-waves embedded in space must cause a local expansion or stretching of space. This expansion contains the mass-energy. This generates an *extrinsic curvature* of space around each particle, and this curvature leads directly to the acceleration of particles towards each other, giving rise to gravity. The theory of gravity is specified by giving the functional relationship between a given mass-energy and the *spatial curvature* it generates – essentially specified by a function: $W(\mathbf{r},t)$, giving the *W-circumference* as a real-valued field on ordinary 3-dimensional space - along with a superposition principle specifying how curvatures of multiple masses add together, and the effect of a gravitational field on energies of embedded particles. It also leads naturally to the consequence that gravity alters the speed of light, *c*, and other fundamental constants as well. This theory departs in a natural way from GTR. We can try to translate the GTR theory of *spacetime* curvature into the present model – the mathematical possibility of doing this is shown by generalizations of Whitney's (1936) theorems. But it results in implausible solutions for the curvature, because of the infinities that arise in GTR.[xvi]

8.1 Unification of Gravity.

Gravity is the effect of the mass-wave stretching the *torus* outwards, inducing a *shape distortion.* While the background circumference is W_0, the stretched circumference, at a distance in ordinary 3-D space, due to a mass m, is written as the *strain function:*

$$W(r) \equiv W(r,m) = W_0\, f(r,m)$$

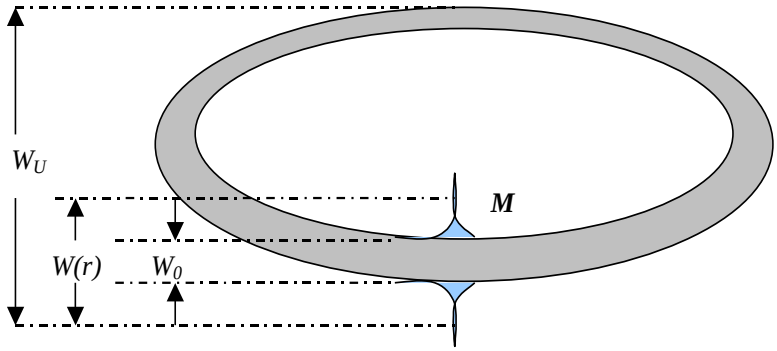


Figure 22.

The strain function induced by a mass, m, is exponential w.r.t. 3-D radial distance: $r = (x,y,z)$, for scale symmetry. The strain function in TAU is:

(27) $W(r) = W_0 \exp(mG/c^2 r)$

This is written in conventional physical constants, and is required to match GTR (up to 3rd order terms). But *the same shape must be determined by the dimensions of TAU alone*, without knowing G or c. The dimensionless factor: $(mG/c^2 r)$ can only be replaced with a dimensionless product of ratios: $(W_0/2\pi R)(W_0/r)$, since the requirement of *scale symmetry* shows: (i) it must decrease linearly with R/W_0, (ii) it must decrease linearly with W_0/r. Hence we set: $\exp(mG/c^2 r) = \exp(W_0^2/2\pi Rr)$, or:

(28) $mG/c^2 r = W_0^2/2\pi Rr$

Hence rearranging and replacing W_0 with h/cm, we obtain the prediction (c.f. (26)):

(29) $G = c^2 W_0^2/m2\pi R = h^2/m^3 2\pi R$ [Prediction of G from R, h, m]

9. TAU is not reductionist.

Materialist reductionism means something like: *"complex objects reduce to the collection or assemblage of their atomic physical parts (or particles)."* Complex objects (chairs, tables, organisms, brains, planets, etc) are said to be defined by *collections of particles,* or by defining *spatial boundaries around collections.* E.g. a galaxy is said to be a collection of stars, a brain to be a collection of cells or atoms.[xvii]

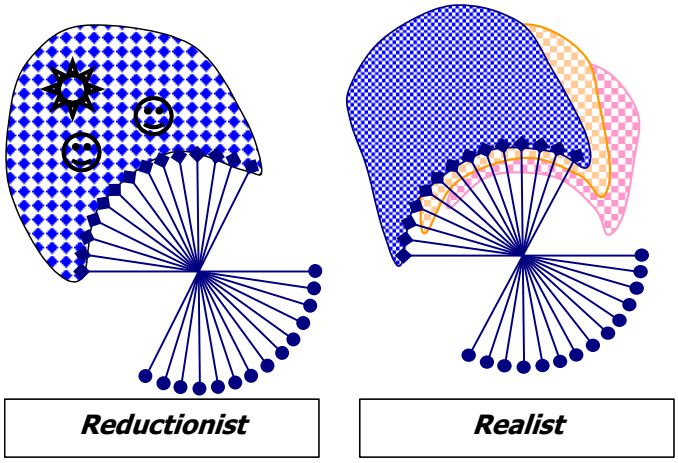


Figure 23.

In TAU, *reductionism* would mean interpreting larger complex objects as their *particle surfaces only*, but this leaves *strings* uninterpreted, and it is inconsistent with the model of quantum entanglements. In a *realist* interpretation, there are at least a couple of layers of *structured entities* in the strings; and in all likelihood, if there is this much structure, there is probably more. But quantum physics lets us reject the simplest forms of *reductionism* in any case.

In quantum mechanics, there are already problems defining 'reductionism'. To start with, we cannot define systems of particles by using *spatial boundaries*. We must define *complex systems,* combining particle states in a special construction called a *Hilbert space*, with the holistic property that *no particle-state is fully independent of any other*. But then, the 'whole system' includes the whole universe, and everything is interconnected! And interconnected *simultaneously*. This idea is already the source of much metaphysical interest beyond physics – with philosophers observing that this quantum 'holism' is similar to Eastern metaphysical conceptions. The idea that the *part-whole construction* is mysterious has a much older tradition in the East than the Western[xviii] notion of the mechanistic physical model. *Reductionism* is inconsistent with our interpretation of TAU in the real world, where emergent entities play the concrete role that explicitly fills the gaps in QM.

9.1 Emergent objects in strings from quantum mechanics.

In TAU, there are really *emergent objects*, separate from their 'physical parts'.

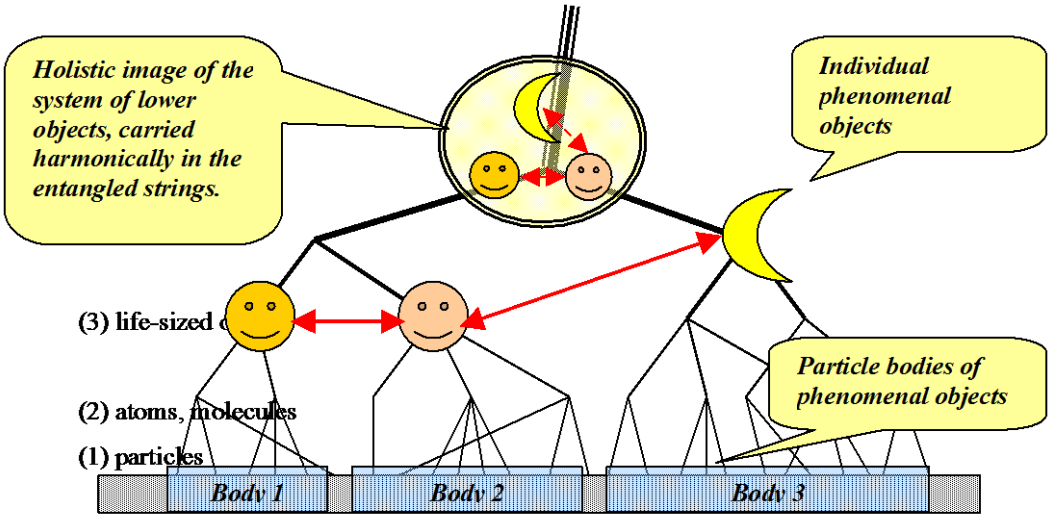


Figure 24.

In TAU, physical particle bodies exist, but they lie under the construction of larger objects, created by string entanglements. Neither 'level' is more 'fundamental' than the other: they are all equally real. The diagram is meant to illustrate two 'persons' and an object ('moon'), each having a physical body, but defined individually as *holistic entities* by string *entanglements.*

- *Physical reductionism fails,* because the *physical particle states ('bodies')* alone are not sufficient to define the complex entangled objects. If we had only the (blue) 'bodies' alone, the *entities* would not exist, although their 'particles' would.
- *Semantic reductionism fails,* because what we refer to and think about as *objects* (in propositions) can only correspond to the *holistic entities,* not to 'particle states'. Actually we are not even consciously aware that 'particles' exist – we are aware that other persons, the moon, and so on, exist.
- The holistic objects not only exist individually – their extensions or 'images' exist within higher-level entanglements again – when the strings from all local entities are bundled together at a higher level again. Higher entanglements are like 'holograms' of the structures below.

We come back to this in metaphysics, when we try to interpret the structures.

10. Time in TAU.

TAU provides a simple solution for a cosmological expansion and contraction cycle, a Cardiod curve. This simple expansion function is:

- $R'(t) = R'_{MAX} \sin^2(\pi T'/2T'_{MAX})$

But it should be noted that *this solution will have perturbations that look similar*, and it is possible some modifications may give a steady state solution. This solution is constrained to give a perfect *particle energy conservation* – but energy in the *strings* may come into play as well, and may allow variations in the solutions.

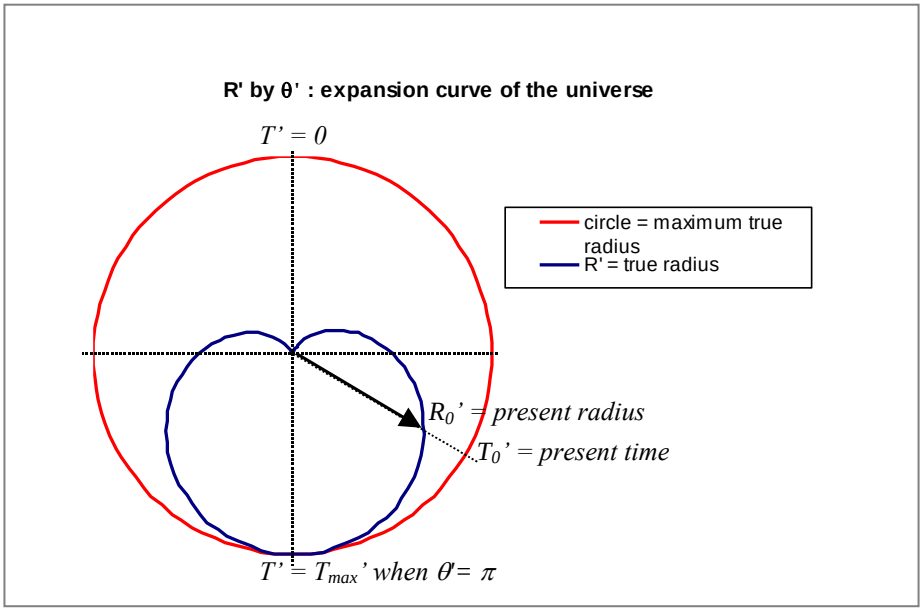


Figure 25.

In this form, we picture universal time, *t'*, or *T'*, in a circle. The angle θ' is time. The expansion of the universe, *R'*, is represented by the (blue) *cardiod curve.* We can work out how far through the cosmic cycle we are in independent ways, from relations between constants, empirical measurements of age, the Hubble parameter, and the rate of change of *G*.

In this solution, the real universe appears to be about 80% through the *expansion half-cycle*, in universal time. However it is possible the time is later, and we could be close to the full expansion point. Note that the time or age of the universe on this clock is universal: anyone anywhere in the universe should conclude that the time is the same.

10.1 Deriving TAU from STR.

We can derive TAU starting *from* STR (Special Theory of Relativity) by simply taking the metric equation, (11) below, but then adding the postulate of *time flow*, which means that there are absolute simultaneity relations and a single absolute frame of reference after all. We are not contradicting the STR metric: we are interpreting it. Let us start the metric equation for Special Relativity (Minkowski) space-time, with *process time* on the left and *space-time* bundled together on the right:

(11) $c^2 \Delta\tau^2 = c^2\Delta t^2 - \Delta x^2$ [STR Metric]
[speed] [proper-time] [space-time]

If we postulate that *time* is absolute, then space and time should be separated, and we must rearrange it like this:

$c^2\Delta t^2 = c^2\Delta\tau^2 + \Delta x^2$ [Rearrange the STR metric]

If we postulate that everything results from a *motion in space,* then on the right-hand-side, we must interpret proper time instead as a spatial displacement, requiring a new dimension of space, *W.* Defining: $\Delta w = c\Delta\tau$, we get:

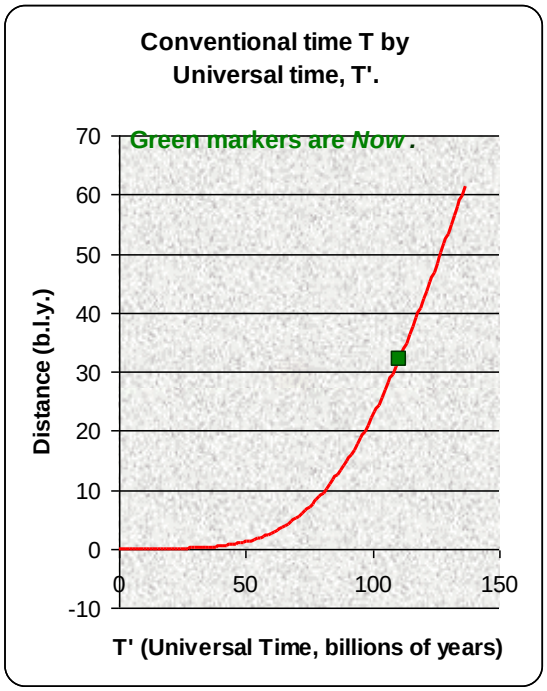
$c^2 \Delta t^2 = \Delta x^2 + \Delta w^2$ [Rearrange]
[speed] [time] [space]

This is simply the *universal speed postulate: (2) dr/dt = c,* where *r* is the simple Euclidean distance in the full space, i.e. (1) $r = \sqrt{(\Delta x^2 + \Delta w^2)}$. If we interpret Δw as a *circular motion,* then the rest of the model, up to QM waves and de Broglie matter waves and Klein-Gordon equations quickly follows. This shows that TAU is not *contradicting STR:* it is practically forced by STR, *if* we take a realist view of time flow. Of course this is generalised, because the Aether is not perfectly flat (as STR requires). A *strain tensor* describes its perturbations, playing the same role as GTR.

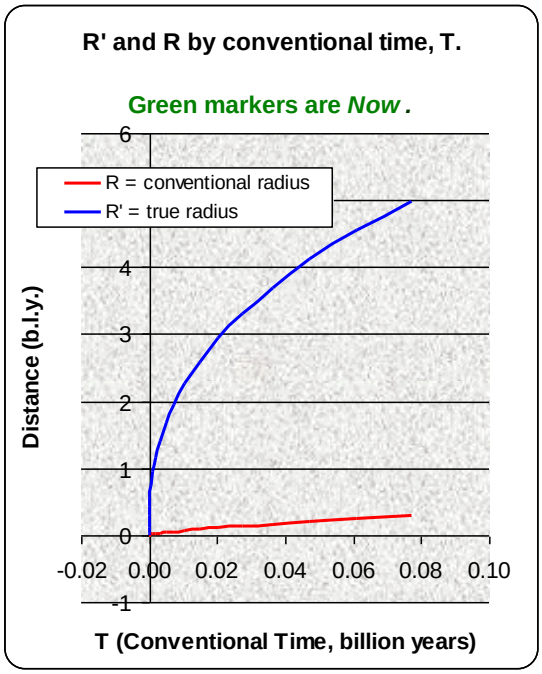
The main difficulty in developing this model lies in opposition to the idea that *simultaneity relations may be real and required in physics after all.* But this is pure metaphysical prejudice; and the philosophy of *space-time* is full of anomalies.

10.2 Time in cosmology

We can think of physical time in two ways: as the *local process time* we experience, which is through chemical or electro-magnetic interactions, or as *universal time*, which is the time of gravitational processes. These diverge as the universe expands (or contracts).



In the early universe, *chemical processes* went much slower than *gravitational processes*, and the first billions of years of gravitational processes represents only a few years of chemical or atomic processes. Hence TAU predicts there should be far more gravitational structures built by early conventional times, galaxies should appear to form too quickly, and there should also appear to be structures that are too old. This shows that the first 50 billion years of *universal time* appeared to take only one billion years or so in conventional processes. The early explosion appears much faster in convention time too – in true spatial variable it is extremely explosive,



Similarly, when we interpret the expansion of the universe at the 'present time', using traditional estimates of the Hubble parameter from red shifts, these must be taken from the past – i.e. distant galaxies. The closest reliable estimates start from about 500M – 1B light years distance. When we look at this from a conventional point of view, it appears like curve that is accelerating outwards – but in fact it is slowing. This is due to the *transformations between time variables.*

10.3 Now in TAU

When we start doing physics, we assume we are at a point, *Now*, in history. Suppose this is the point **P** in the event-history. At this point we will set physical units for space, time, mass, charge, and measure the physical constants in this system, and measure the universe radius, *R*. In conventional physics, the units and constants are assumed constant, and the radius increases. But what happens in the more general case where *the physical constants change with expansion*? Lets transport some physicists from our first present time, ***P,*** to a future time, ***Q***, and let them repeat their process, and set units by the same procedure, measure the physical constants, and measure the universe radius.

What do they find, assuming the expansion is described correctly by TAU? The easiest to visualise is *length.* TAU means that, as the universe is expanding the micro-scale torus is shrinking, and all our measuring rods are shrinking too - but we are blissfully unaware of this because everything is shrinking the same.

True spatial variables

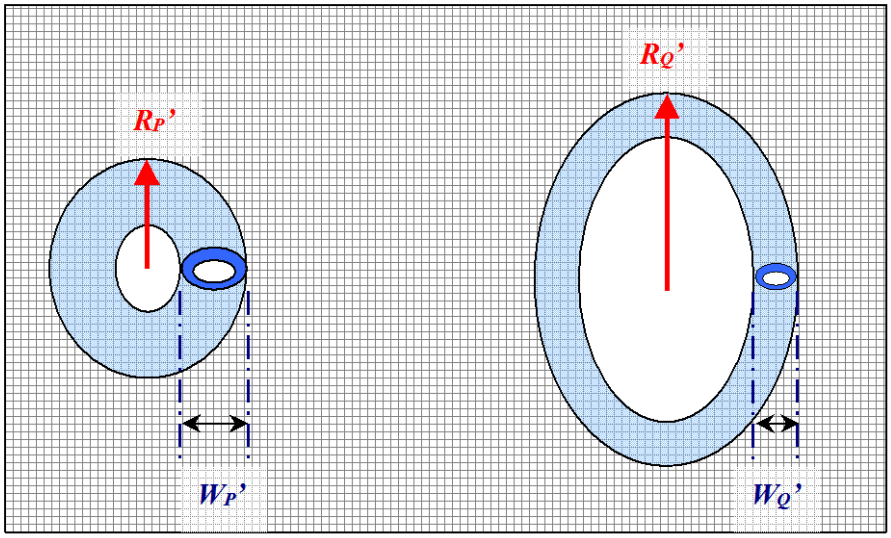


Figure 26

To indicate that we are describing the universe in the *true spatial variable,* (postulated by TAU), we use *dashed variables and constants: R', W', c', etc.* The universe radius *R'* expands and the torus *W'* shrinks, so that: *R'W' = constant*. The common background grid in the diagram indicates that we are comparing two states of the universe expansion against a single universal measure of *length*. But if we could

maintain this spatial metric through time, we would see objects *shrink* – since atoms shrink to match the shrinking *W'*. We will also see the speed of light *c'* increasing, intrinsic angular momentum *h'* decreasing, and so on.

However, using the physicist's *instrumentalist* methods for setting the physical variables – using measuring rods or light beams or quantum wave periods or radioactive decay rates (in fact anything *except processes involving gravity*) – will give the result that *c, h, m, q* are unchanged, and *measurements of lengths will appear unchanged.*

Conventional spatial variables

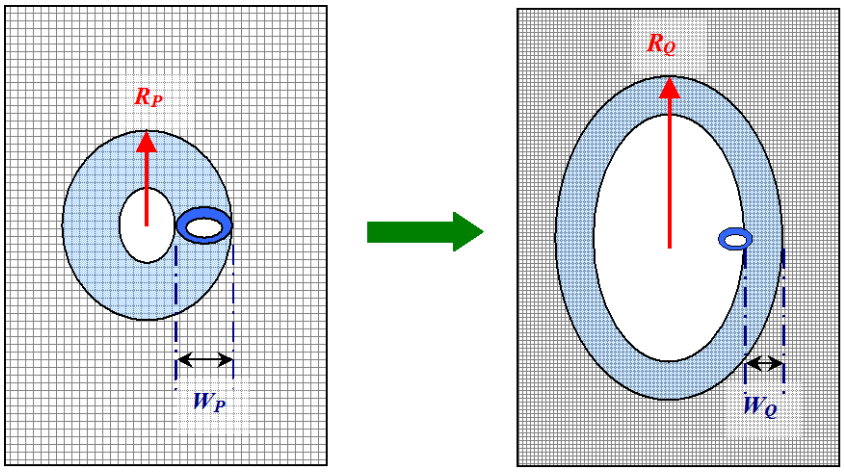


Figure 27.

In the *conventional system of variables,* the universe radius *R* expands, and the torus *W* appears constant, allowing the conventional variables, *c, h, m, q,* to remain fixed.

- (Note this means that *RW increases,* and aether volume is not conserved. The major conservation law of TAU fails *if we use the wrong spatial metric.*)

The Invariant Quantity of Length for our Universe.

Total volume of the aether is constant, meaning that: $R'^3 W_e' W_p'^2$ *is constant.*

Defining the "average *W'*" as: $W' = (W_e' W_p'^2)^{1/3}$, then: $2\pi R'/W' = D' = h'c'/2\pi m'^2 G'$.

Since: $2\pi RW = constant$, then: $\sqrt{(2\pi RW)} = (W^2 hc/m^2 G)^{½} = (h^3/cm^4 G)^{½}$ ***≈ 6,463 km.***

This is the truly invariant quantity of length for our universe – the 'average circumference'.

C.f. Earth radius is 6,353 km to 6,384 km (avg. 6371 km).

In the conventional variables, the *unit of length,* call it ΔX, that is assumed to be a constant length, is *really shrinking in the true variables.* We can think of the conventional ΔX as really equivalent to *W,* since it is defined instrumentally to make

this constant: $\Delta X \equiv W$. So how do we relate the *true variables* to the *conventional variables?* In TAU, we know that W' decreases as R' increases: $W' = W'_0 R'_0/R'$, but W always equals the original value, W'_0, so: $W = W'_0 = W'R'/R'_0$. But as: $W' \equiv \Delta X'$, and: $W \equiv \Delta X$, then: $\Delta X = \Delta X' R'/R'_0$. Or equivalently, we write the *space metric transformation:* $dx = \hat{R}'dx'$ (See: Eq. 13.3).

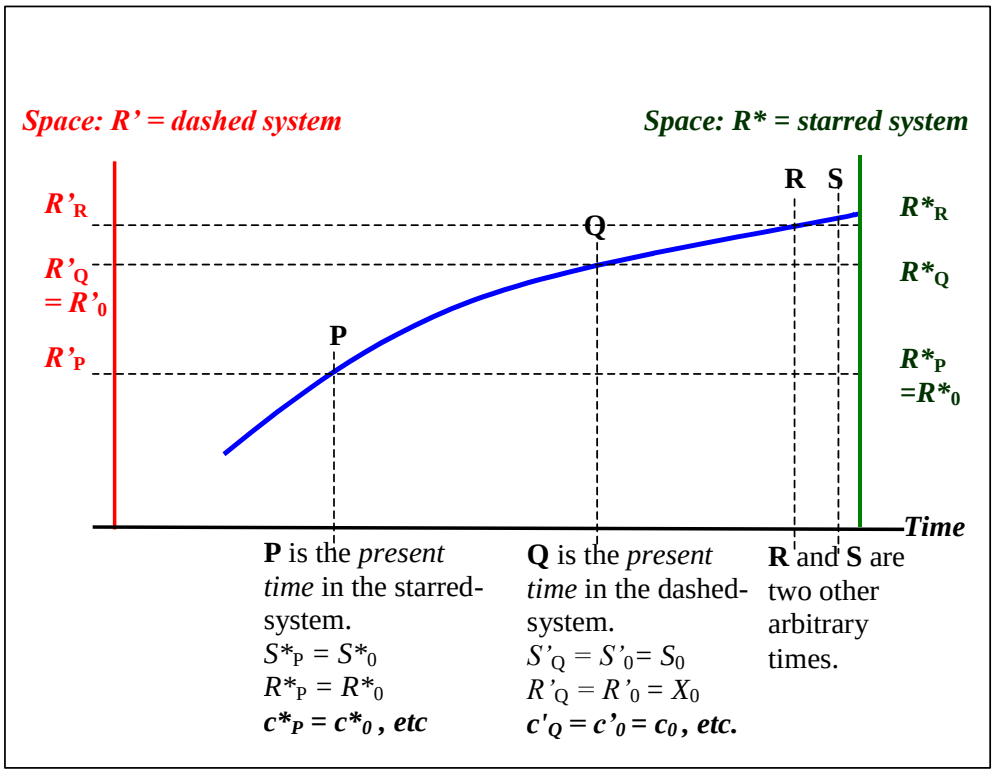


Figure 28

More generally, we can work out a logic for evolving constants, by requiring symmetric forms of the laws in our system of variables, whether we start at time ***P*** or time ***Q*** is the *present moment.* Rather than derive this here, it is more illustrative to see how our two variable systems behave. We assume that moving from ***P*** to ***Q*** doubles the radius. And we assume that we *define our true coordinates at* ***P*** *so that m', c', h' and q' are initially equal to 1.* In fact this is the sign of *when we defined the present moment for the system.*

10.4 Variable transformations by time.

Comparing two different coordinate systems, both starting at *Now* = P.

True coordinates		***Conventional Coordinates***	
Now		***Now***	
At ***P***	At ***Q***	At ***P***	At ***Q***
$R_0' = 100$	200	$R_0 = 50$	200
$\hat{R}_0' = 1$	2	$\hat{R}_0 = 1$	1
$m_0' = 1$	½	$m_0 = 1$	1
$c_0' = 1$	2	$c_0 = 1$	1
$h_0' = 1$	½	$h_0 = 1$	1
$q_0' = 1$	½	$q_0 = 1$	1
$G_0' = 1/100$	***1/100***	***$G_0 = 1/100$***	***1/400***
$D' = 100$	***400***	***$D = 100$***	***400***
$W' = 1$	½	$W = 1$	1

Comparing one coordinate system, starting at different *Nows.*

True coordinates		***True Coordinates***	
Now			***Now***
At ***P***	At ***Q***	At ***P***	At ***Q***
$R_0' = 100$	200	$R_0' = 200$	400
$\hat{R}_0' = 1$	2	$\hat{R}_0' = ½$	1
$m_0' = 1$	½	$m_0' = 2$	1
$c_0' = 1$	2	$c_0' = ½$	1
$h_0' = 1$	½	$h_0' = 2$	1
$q_0' = 1$	½	$q_0' = 2$	1
$G_0' = 1/100$	***1/100***	***$G_0' = 1/400$***	***1/400***
$D' = 100$	***400***	***$D' = 100$***	***400***
$W' = 1$	½	$W' = 2$	1

10.5 Static and dynamic time.

The physical theory of TAU uses a *time flow* ontology, encapsulated as follows.

It is defined in contrast to the conventional *static view* of time[xix]:

"The static theory of time *holds that all physics must be represented as fixed events in a 'static space-time manifold'. Time is spatialised, or objectified. Time becomes a concrete object, extended just like an extra spatial dimension. 'What exists', or 'reality', is a single static concrete object, a fixed network of events spread out across all time and space, like a cosmic wall-paper. The 'laws of physics' are just patterns found among events on the space-time manifold – as we find patterns on wall-paper. Everything that has ever happened and ever will happen exists eternally, as the facts of our world-history. Our normal belief that the world is happening, that it is open to change, or to our causal intervention, or to our choices or our acts of will, is really a delusion. Our normal belief that our conscious perceptions represent a changing present is a delusion. Every experience we have exists for all time, without any temporal status - nothing is really past, present or future. 'The present' has no special status – in fact it is indefinable on this view.*

The time flow view *takes the physical world to exist as a set of persisting physical entities in space, as we normally think. The physical world exists in its present momentary state, but the present state changes. Basic physical objects (like particles) or basic physical 'stuff' (like energy), as well as space itself, persists in existence through change. Time is not an entity like space. Instead time is a construction or representation of the sequence of change. The physical world has a continuous existence, but changes its state, and the class of all the truths about the world changes. The laws of physics are the rules governing physical change. The time parameter enters into the equations of physics primarily to define rates of change. Change does not just happen randomly: one state leads to another, and then another, according to causal laws. The causal laws are naturally future-directed, because the present state is always responsible for generating the next state. Causation does not imply determinism: change may be intrinsically probabilistic, at least in part. But fundamental physical objects (or fundamental stuff like energy) do not randomly appear and disappear through time – they are fundamental precisely because they persist in existence through changes of state.*

These two views deeply condition our understanding of all kinds of metaphysical concepts – from scientific metaphysics of causation, explanation, determinism, laws of nature, symmetries, space and time, information, to general concepts like consciousness, experience, action, will, possibility and necessity, counterfactuals, value, purpose, personal identity, death, spirituality, existence, knowledge, meaning, semantics, properties, abstract objects, realism. On the neo-positivist's view, these are effectively closed subjects: metaphysics is purely and simply the metaphysics of the material world in the static ontology of space-time. On the time flow view, the whole world of metaphysical questions remains open and real, and current scientific explanations and reductionist metaphysics are not satisfactory."

10.6 The time flow ontology.

- ***Past, present, future.*** *There is a present moment, a set of past events and a set of future events. In the space-time diagram, the present moment (Now) is defined as all the events in space at a specific point of time, e.g. all the events defined at* t_1 *above. (A slice of space-time). Time is not an entity (like space), but a construct from the sequence of change.*
- ***Temporal relations.*** *Events at the same present moment are absolutely simultaneous. Events at a later moment are future events. Events at an earlier moment are past events.*
- ***Truth and representation of facts.*** *Any spatial representation (like a space-time diagram with the present moment marked on it) can be actually true only for an instant – as the present moment moves forward into the future, the representation of the present moment becomes outdated, representing something that was true in the past.*
- ***Universal Laws.*** *The laws of physics have time translation symmetry, i.e. they remain constant as time changes, but have an intrinsic time direction, reflecting the sequence of change. This is reflected by the fact that in a valid coordinate frame, the laws appear invariable w.r.t. time translation. In any such frame, we can universally quantify time over the laws of physics.*
- ***Valid coordinate frames.*** *There is always at least one such valid coordinate frame for time, viz. where coordinate time t coincides with simultaneity, and where the metric for t coincides with the universal rate of time flow in which the laws of nature appear to have a constant form. It is an empirical question whether this is defined as an inertial frame or not. There may be more than one valid frame, depending on the symmetries of the laws of nature.*
- ***Causation.*** *Causation is future directed from the present state. The complete present state of the universe is the maximal causal condition (boundary condition) that the laws of nature apply to, to determine the future states. This includes dynamic properties (like velocities), as instantaneous limiting properties (d***r***/dt = limit dt→0 (***r***(t)-***r***(t-dt))/dt).*
- ***Determinism.*** *Future states need not be uniquely determined by the present state combined with the causal laws – they may be intrinsically probabilistic. Past states are only determined indirectly, by the requirement of consistency with the present state and the future directed causal laws – with probabilistic causal laws this will normally require epistemic probabilities.*

This is the theory of (Newton's) *Universal Time, t,* for the *aether*. Inside TAU, we experience a different time – and different temporal unfoldings – because having memories and foresight and intelligence means that we can control the unfolding of time, and write its script before we set it playing. To answer these questions about time we have to go into metaphysics, because it involves our consciousness. TAU tells us that our experience of *time flow* involves our consciousness invoked by complex formations of the dynamic aethereal state in time. But in how many places, forms and times are these 'complex formations' held in the aether?

10.7 Space-Time is not real.

The conventional physicist claims that *the foundational principles of physics [meaning its metaphysics] are fixed by the space-time plus QM paradigms.* From the foundational point of view, TAU means exactly the opposite.

- TAU ➔ there is no *'intrinsic space-time (Lorentz) metric'*: the relativistic metric emerges from the Euclidean geometry of the aether, because of *universal wave speed in the 5-D aether surface.*
- TAU ➔ there is no intrinsic *quantisation* of the particles: quantum effects emerge from the continuous finite geometry and shape of the aether.

The aether is not a *space-time* manifold; it is only *space*. The conventional *relativistic space-time manifold* is merely a mathematical construction from this point of view. The aether is governed by very simple laws based on *time translation invariance and scale symmetry with a Euclidean metric.* The particle interactions described in quantum physics are the projection of 6-D wave-shapes of the aether onto the 3-D hyper-surface of 'observable space'. The properties of quantum mechanics appear in the 3-D projection, and are universal in *particle physics, in our cosmological era*, but are not fundamental laws. Quantisation is determined by the *length ratios defining the shape* of the aether. Likewise, the relativistic space-time metric (STR or GTR) appears in the projection onto 3-D space, but it is not a fundamental law. STR (or its equivalent) emerges from the identification of proper time with the circular wave motion. GTR (or its equivalent) emerges from the stretching of space. Strings are the natural continuation of the wave perturbation, missing from QM and GTR, and give a realist model of the point-particle 'black hole' as a hyper-dimensional 'worm hole' or *string* of *aether*.

The Aethereal Universe contradicts the claim that the 'paradigms of conventional physics' *must be taken as fundamental*. It reduces them to secondary laws, just as modern physics did to classical physics. The present laws may be empirically very accurate, but if they are *about the wrong thing*, they give the wrong concept of *physical possibility. Possibility* is a fundamental metaphysical concept. Changing the ontology to TAU means the physical construction is simplified in essence, but *possibility* is expanded in reality.

PART 2. THE METAPHYSICS OF TAU

We now move on to consider the broader metaphysics of the Aethereal Universe. On one hand, TAU allows (and requires) certain kinds of structures that may exist, inside the hyper-sphere. These can be formed from strings converging into 'bubbles' or 'spaces' of Aether. They are held together by the strings. They may be enduring, temporary or permanent. Sub-spaces with possibly 2, 3, 4 or 5 dimensions extended at once are possible. On the other hand, we have phenomena we wish to explain using these structures. The best place to start is with *ourselves*: what are we in the model? What carries our personal identity or self? What represents intelligence, thought, perception, consciousness? These are real things to us. They are a real and direct part of our experience. They should relate to the model structures, if TAU is true.

I start here with basic metaphysical concepts, and then go on to internal structures that TAU makes possible. This gives a kind of preliminary 'chemistry set' of structures to conceptually relate to. For the second part of the problem, I start by suggesting the simplest kind of plausible interpretation of folk concepts of personal identity to the simplest types of structures in TAU. This reveals the broad possibilities, but with little detail. To provide detail, I subsequently refer to a sophisticated metaphysical system, belonging to the *Sanatan* school of thought, as described in *Yoga Darshan.* This is the best example I know of a systematic metaphysical exploration of the soul, based on introspective and meditation practices, such as you would expect if TAU were true.

We as persons are complex constructions. We have physical bodies under our control, we identify ourselves with a 'private' individual 'holistic' consciousness, we have a primary experience of time flow, with a phenomenal world appearing in our perceptual fields, and a conscious train of thought and internal monologue in a propositional language, as well as memories and rational processing and feelings, and so on. This is the mind and person, and it is an awfully complex thing to analyse. *Yoga Darshan* represents a sophisticated model of this. It is not a 'cognitive model' or a 'psychological model' or a 'neural model', or any other kind of 'scientific model' we know of in Western science. It is a *metaphysical* model. TAU is compared against this in the final sections.

11. The particle world is only part of TAU.

The first metaphysical consequence of TAU to emphasise is that the realm studied in physics, i.e. physical objects in 3-dimensional space, from sub-atomic particles to galactic scale, *is only a part of the universe.* It is *a '3-D hyper-surface' of a larger, hyper-dimensional whole.* A 'three-dimensional physical world' is projected into view to us, but its completeness is illusory.

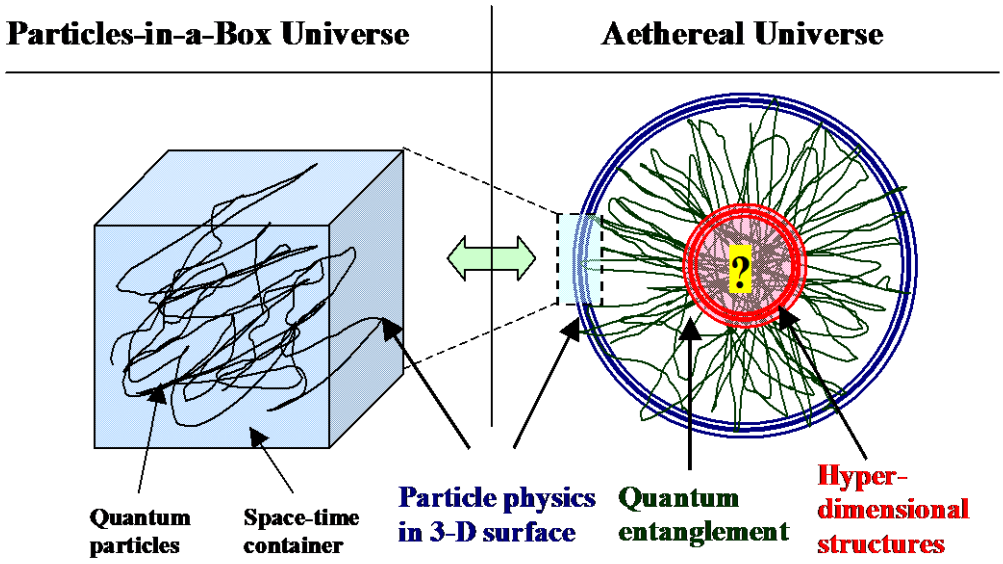


Figure 29.

The particle universe of materialist physics is only a part of the full aethereal universe. It is a 3-dimensional 'hyper-surface', enclosing a much larger complex structure. Inside the universe's 4-D hyper-sphere is a spider-web of highly filamented merging and entangling strings, converging to a center. Strings carry vibrations, and speed of transmission is very fast, so inside is connected together on the time-scale of about 10^{-20} seconds (about the time for light to cross a hydrogen atom), even though it is billions of light-years across in space. Fundamental particles, like electrons and protons, are wave perturbations in the hyper-surface with *strings*, which are very fine-scale continuations or *extrusions* of the perturbation of the aether, that cross inside the 3-D hyper sphere of the universe. Each particle is connected to its symmetric anti-particle. Strings also *entangle* and *merge.* But although the theory determines some properties of the strings, it is quite unknown what hyper-dimensional structures exist.

12. TAU does not have embedded particles.

There are no *particles embedded in the aether*. The wave-shapes *of* the *aether* itself are what appear to us to be 'particles', or apparently separate individual entities, appearing with emergent quantum mechanical properties.

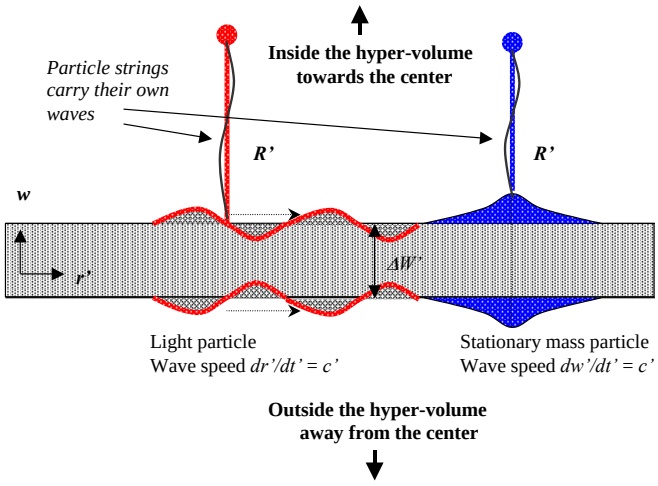
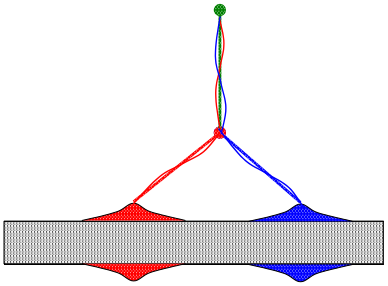


Figure 30.

Although they are individuated as 'shapes', particles are really parts of a single continuous substance. So is everything else, and the resulting *part-whole* metaphysics has properties like fractal patterns, rather than machines with moving parts.

Quantum mechanics reflects the wave perturbations, and entanglement of particles strings, and the distinction of particle strings and waves, but does not describe it realistically, and says nothing about any structures that might exist in higher dimensions.



The normal quantum wave equation (Schrodinger, Klein-Gordon, Dirac equations) describes the surface wave perturbations. *Entanglements* emerge when we combine single particles into multi-particle systems. The formulation of the quantum multi-particle systems as *Hilbert spaces* reflects string entanglement. Quantum field theory describing particle interactions reflects merging and splitting of strings. But various things missing from quantum mechanics – filled in by 'observers', 'many worlds', 'consciousness', 'wave-collapse mechanisms', etc – are now provided by the mechanics of strings (or hyper-dimensional structures) within the hyper-sphere.

13. There are higher dimensions.

The most striking thing of all is simply the fact that there are extra spatial dimensions beyond the three apparent to our senses, and it is most likely to be filled with entities and interactions of which we are only dimly aware! This implies *some level* of 'supra-natural' causal connectivity underpinning the order we see in our physical projection.

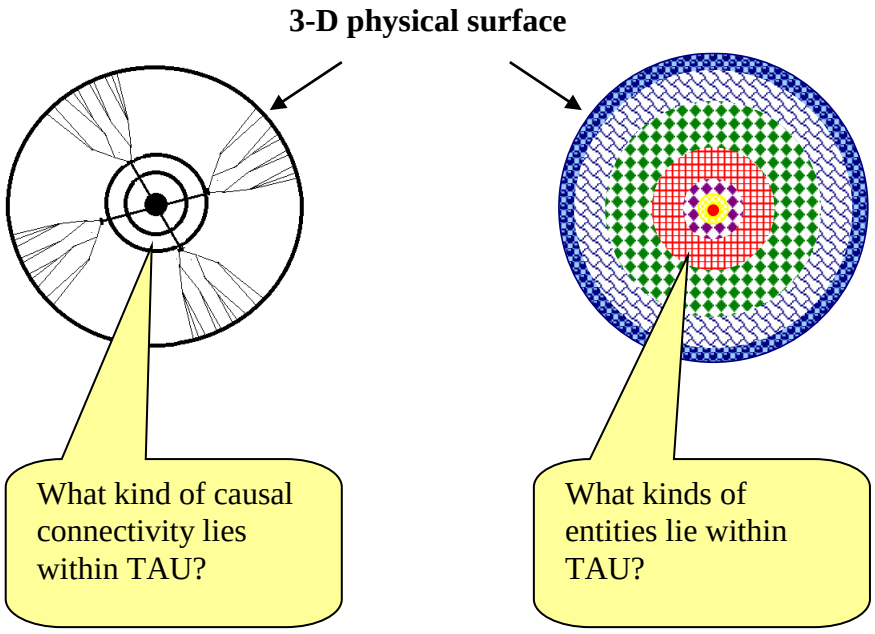


Figure 31.

Two icons of TAU. How is it causally connected together? What kinds of complex entities might it host? What can we infer about our own nature?

The existence of higher dimensions has been accepted by many physicists over the last two or three decades - and it is really the most radical piece of metaphysical speculation in the history of science! It opens the possibility of all kinds of hyper-dimensional realities to which we might connect!

For decades, spiritualists, alternative thinkers, and 'new age' theorists, etc, have appealed to 'other-dimensional beings' and 'other spiritual dimensions', or 'communicating via other-dimensions', and have been openly mocked in science for inventing metaphysical realms; and yet now the physicists themselves have come to believe in a realm of unknown 'hyper-dimensions'! But is it possible that the physicist's new dimensions host the spiritual entities?

14. A realist interpretation of spiritualism.

So far there is little or no *concrete physical theory* from the physicists about what might be in hosted in the higher dimensions. Materialists may still reject the 'alternative theorists' interpretation, and say they have no evidence of any *complex hyper-dimensional structures* influencing us except through particles physics.[xx] in fact the new dimensions are only there to *play a specific mathematical role*, and nothing more can be inferred from them without an extension of the theory. The physicists' conception of *hyper-dimensions* is still a mathematical one: they are only half-way to a realist interpretation. The Aethereal Universe proposes a fully realist, concrete theory, and makes it visualisable how we could *really be living in a hyper-dimensional space*. [xxi].

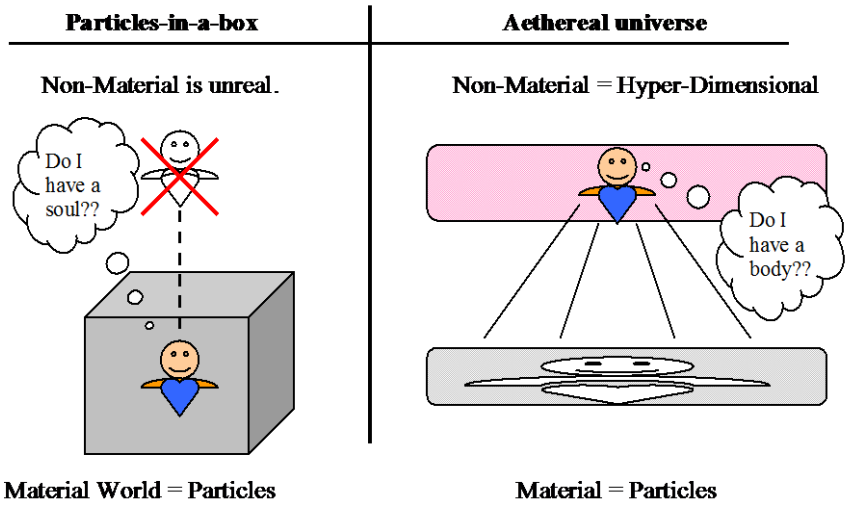
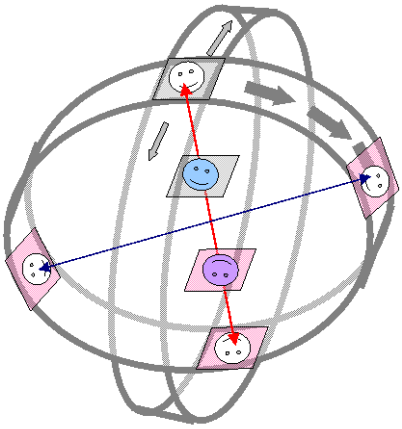


Figure 32.

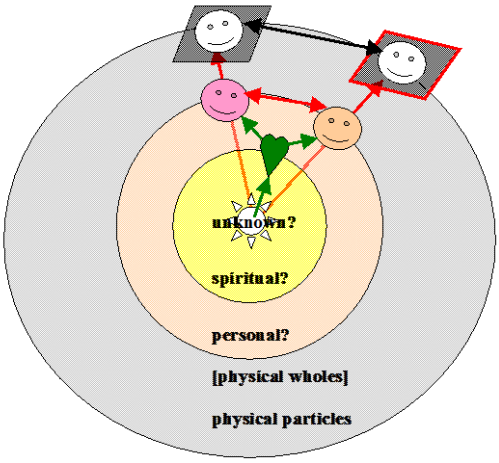
In the materialist universe there can be no 'souls' or 'spirits', because there is nothing they could correspond to, and nowhere they could be. But the Aethereal Universe provides entities in hyper-dimensional space that connect our physical particles together as a whole, and carry our holistic identity. There are now realistic correlate for 'souls' or 'spirits' and many other metaphysical concepts. In fact, they seem to be forced on us: we must identify *ourselves* with complex entities that only arise at levels above the surface of physical particles. In any case, the materialist's complaint that *there is nowhere for a spirit world to exist* is wrong.

15. What are we in the aethereal universe.

An 'apparently-3-dimensional' physical world is projected into view to us, but its *completeness* is illusory, and it is really part of a larger complex structure. We are not just 'physically connected' with this larger structure, we are intrinsically part of it. We would identify ourselves with non-physical rather than physical elements in the *aethereal* structure.



Our conscious experience and awareness of a 'self' cannot be identified with the particle physics of the brain. It must be correlated with the *holistic representation of the physical brain*, but this is a complex, entangled hyper-dimensional object that exists *inside the hyper-sphere.*



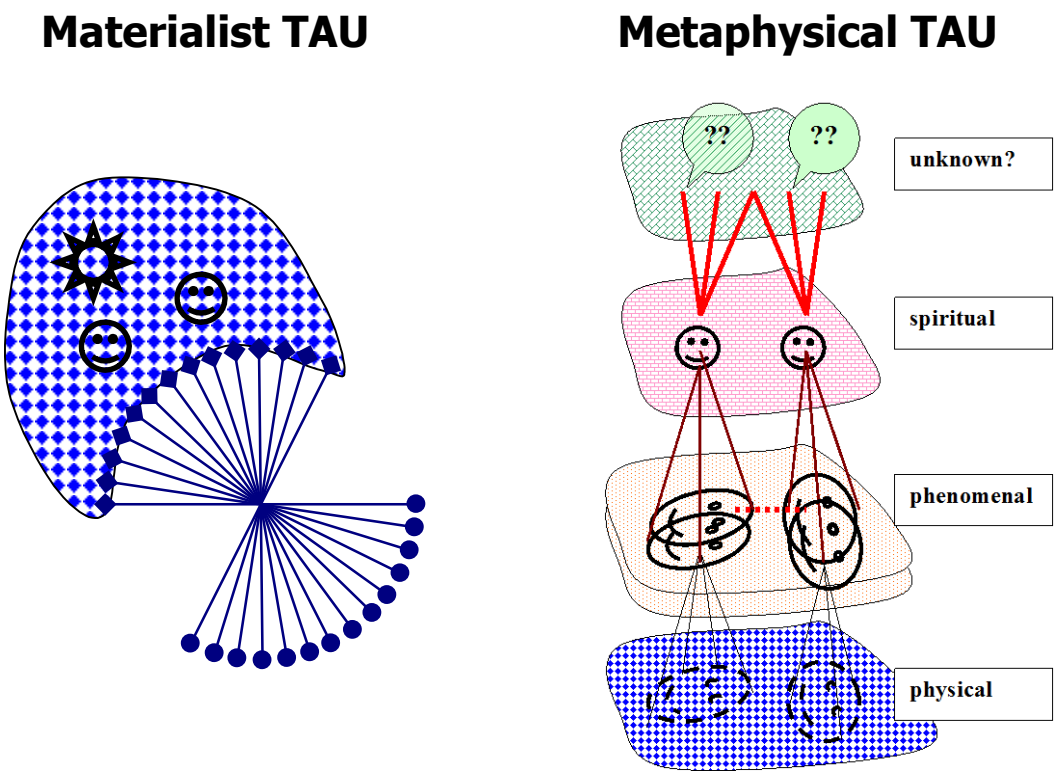
To model *spiritual realism*, I subsequently propose there must be *nested hyper-spheres*, hosting different kinds of entities at different levels, according to the dimensionality of their sub-spaces, and the kinds of structures they contain. This raises as serious questions in TAU:

Some metaphysical questions in TAU.

1. are we (persons) identified with permanent or impermanent entities (souls)
2. are we reincarnated in future lives on Earth (reincarnation)
3. is there direct communication between non-physical, holistic entities (psi)
4. do complex non-physical entities exist autonomously without particles (spirits)
5. if so can they interact with our particle world (ghosts)
6. is formative information distributed through the structure (morphic resonance)
7. does order and information derive from a central intelligence (design)
8. is the universe as a whole alive or conscious (holism)
9. as individuals do we make contact with each other directly (love)

16. Materialist TAU versus Metaphysical TAU.

We can state the challenge that TAU poses for materialism quite directly. In TAU, there are still the two diametrically opposite metaphysical possibilities, corresponding exactly to *materialism* and *spiritualism*. Both are possibilities from the physics of TAU alone – without taking note of any content beyond physics. *A priori*, TAU allows materialism *or* spiritual realism to be true. To decide which is more likely, we have to interpret the *empirical and experiential content of our world*.



Materialist TAU says that *although it is possible for there to be deeper causality, there is only surface causality*, meaning that everything is driven by the *laws of the particle intersections on the surface. Reductionism, purposelessness, mechanical evolutionary from random origins, nihilism, atheism, are all retained in the world view.*

Metaphysical TAU says that *there really is deeper causality.* Meaning that *information, design, purpose, intelligence, life,* are inherent in deeper structures of TAU. There must be at least four or five 'ordered structures' to account simply for our 'folk concepts', of the *physical, phenomenological, spiritual, super-natural, divine.*

Figure 33.

17. Materialistic TAU.

The first possibility carries the general philosophy of *materialism* over into TAU.

- Everything is driven by the *physical surface particle interactions.*
- There is no interesting structure inside TAU, no global structure in the strings.
- There are no forms of 'higher entities' in the strings, only lower-level entanglements, as required to keep the surface particles going.
- String structures inside are mere 'reflections' of surface causality.
- Natural processes are 'random', not centrally planned, designed, controlled.
- Processes are causally driven from the outside in.
- Entities like persons, etc, are physical 'entanglements' of particles, but at a low level.
- Our consciousness may be connected to an especially complex entanglement (hosted by our brains), but this is just a dynamic state, that 'evaporates' when we die, just as our bodies disintegrates its particles.

From this they would retain all their nihilist conclusions. But how do they know this?

"*Because we live in the physical world, in the surface you are talking about, and we interact there, make things happen, build machines based on strict adherence to the particle laws you are talking about, and if there was some other world 'inside', in hyper-dimensions, as you say, wouldn't it be apparent to us? Wouldn't we see it? Wouldn't there be strange causality paradoxes and such like apparent? Instead we see the world works according to strict physical laws without exception."*

But these are poor reasons. It starts with the *materialist assumption* that *we are particles they identify in particle physics.* But why assume that *we exist in the particle surface?* Even on the materialist theory, we are at least complex entangled objects (representing brain states), higher up in the string structure. We *cannot be* particles. And what about all the people who *do* claim that there is weird causality in the world, that 'psychic' phenomena, 'morphic resonance', 'spiritual' phenomena, etc, are real? The claim that 'strict universal physical laws' rules out metaphysical entities is another carry-over from materialism, and is simply untrue *in TAU.*

18. Metaphysical TAU.

The repertoire of possibilities in a fully realistic metaphysics ranges from 'locally organised chaos' with some enhanced 'information mechanisms', but no purposeful global design, to a fully powerful divine Creation controlling the development from the center outwards. In between are:

- 'locally-organised chaos' with non-physical structures for persons, identities, etc, and new 'information mechanisms', but *no purposeful global design*.
- '5-higher-dimensional alien conspiracy' theories, threatening our existential position as a species in a vastly expanded game of 'galactic politics';
- or equivalent moral wars in terms of God and angels versus Satan and devils;
- naturalistic or pantheistic theories, with order and life driven from a benevolent center, enhanced with spiritual-physical 'bridges';
- a fully powerful divine or mystical Creator controlling the development from the center outwards.
- Propositional or computational theories where the string universe turns into a *propositional representation.*

Here I propose a *fully realist TAU,* with structures that are suitable to represent these various concepts. The idea is to include at least four levels in a realist model of 'folk concepts' of spiritual existence: (1) the physical – (2) the phenomenological world – the world we *appear to see and touch and feel – that we feel we share with others* – (3) the world of our own spiritual identities: we have personal identities that participate in the lower world of phenomenal and physical reality – (4) the world that transcends our personal world in TAU: higher spiritual realms in mystical religions.

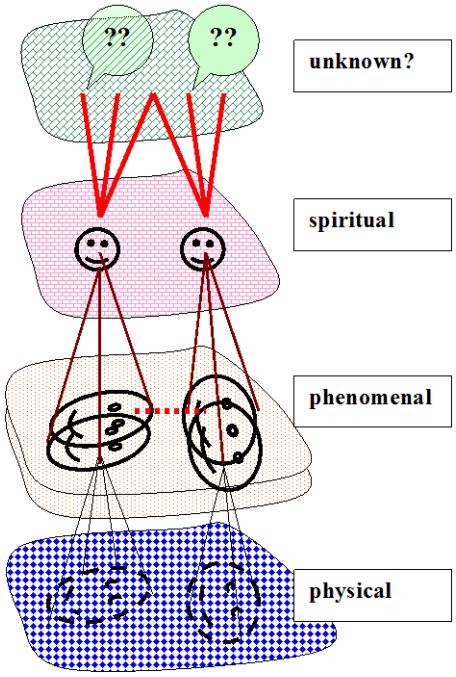


Figure 34.

Next I propose a small number of forms of the aether, as fundamental to the possible construction of entities.

18.1 Metaphysical TAU structures.

The next three sections summarise three kinds of structural features in TAU.

Hierarchical Constructions – 'entity composition'

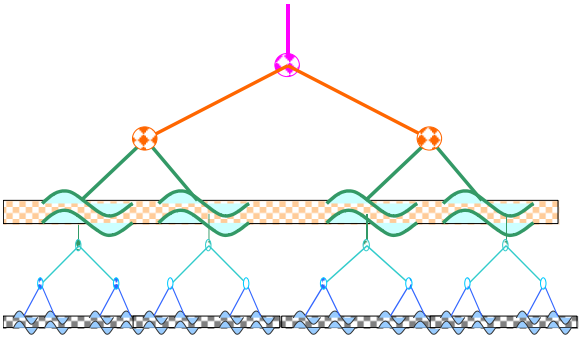


Figure 35

Horizontal constructions – 'causality'

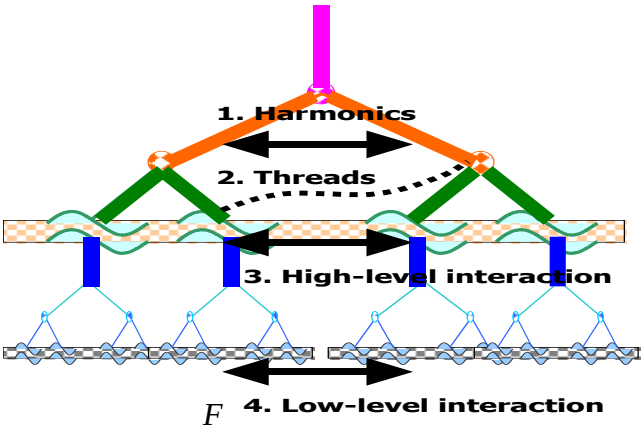


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Figure 36

Propositional constructions – 'information'

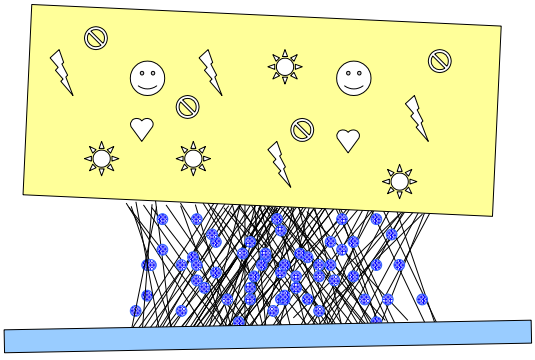
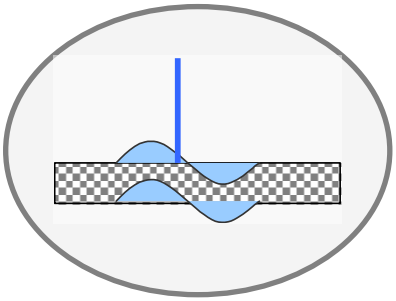
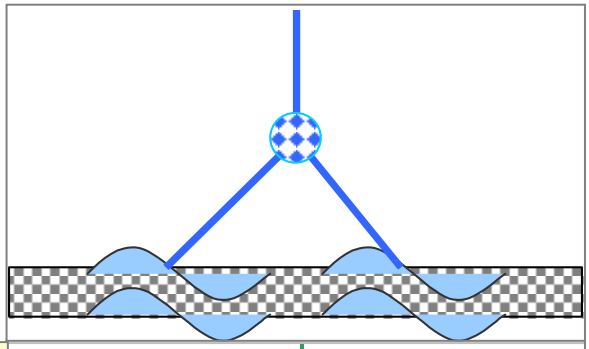


Figure 37.

18.2 Hierarchical Constructions – composition of entities.

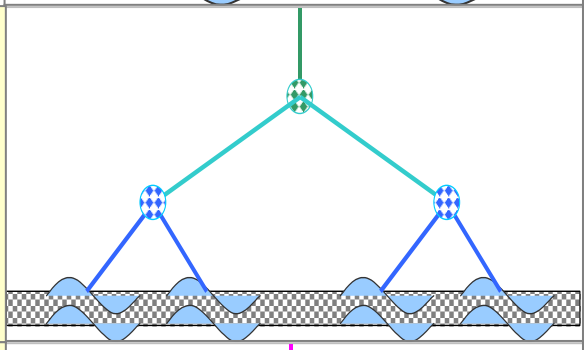




Physical particles:

- A single particle ➔
- Two entangled particles ➔
- Two pairs of entangled particles with a second-level entanglement

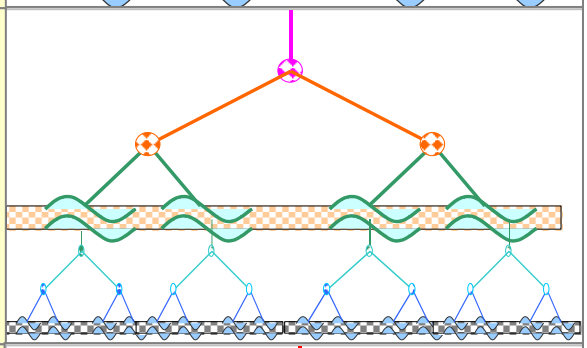
There is only one *manifold* so far.



Phenomenal manifold:

- Multiple entanglements below create complex objects above
- These exist in their own inner *hyper-sphere*

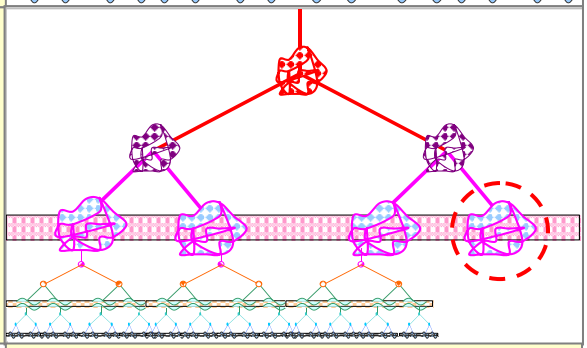
There are now *two manifolds*.

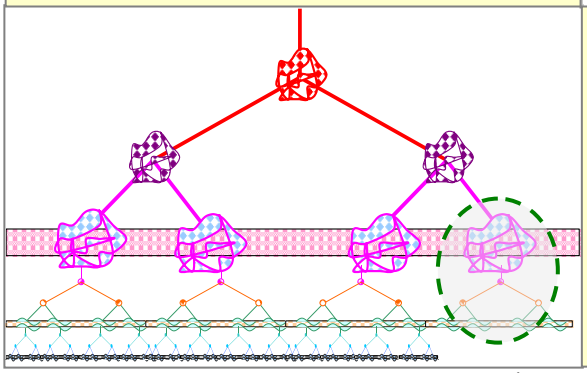


Spiritual manifold:

- Third-level entities in the next manifold are *personal identities.*
- These have content from the phenomenal manifold

There are now *three manifolds*.





Spiritual manifold:

- Above shows one spiritual entity with no physical or phenomenal connections – detached spirit.
- Left shows a spiritual entity with a *phenomenal presence* but no physical presence – a 'ghost'.

Figure 38.

18.3 Horizontal Constructions – interactive causation.

Horizontal relationships between entities in the same level of manifold is what we think of as 'causality'. This communicates an effect from one place in our space to another, or from one entity to another. But there are more possibilities.

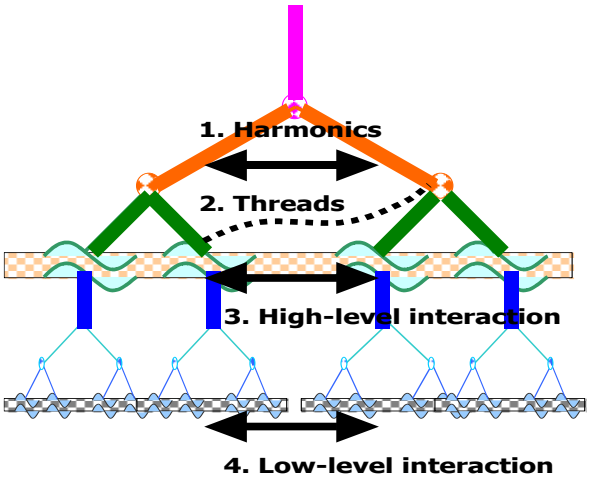
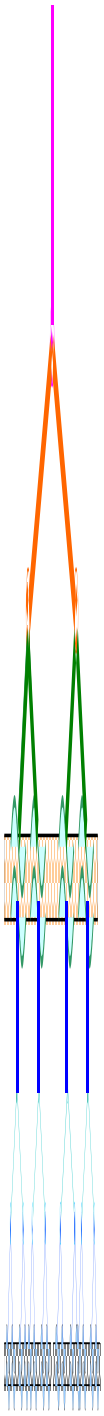


Figure 39.

1. String harmonics. The string structure schematised left is extremely stretched out in reality, and the strings are extremely close together. String harmonics are fundamental to the entanglement. At higher levels they provide mechanisms for storing memories and communication of information *horizontally* – appearing causal.

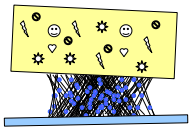


2. Threads. Entities that interact in the past may retain 'threads' of aether directly connecting them, or connecting their lower structures.

3. Higher manifold causality. 'Motion' through the higher manifolds brings entities into contact with each other. In higher level manifolds, interaction is through the laws appropriate to its dimension structure.

4**. Interaction through the physical manifold.** 'Motion' through the physical manifold brings entities (particles) into contact with each other. In our physical manifold, they interact through electro-magnetic and gravitational forces.

18.4 Hyperintensional Network Structures.



It must be emphasised that the object relationships via strings *are not just hierarchical tree structures. Trees* converge to a *single stem upwards (inwards)* at each node. This is the classic *file hierarchy*, *evolutionary hierarchy*, *mechanical assembly hierarchy*, *etc.* But it is a very *poor* structure mathematically: its 'representational power' is very low. We take a giant leap in complexity by allowing a 2-parenting structure, with both parents structures acting holistically as tree hierarchies, as illustrated below in an example from information theory. By allowing horizontal joins with a third and fourth parent, a network structure empowering a *hyper-intensional semantic language*, like *TIL*[xxii], has been constructed.

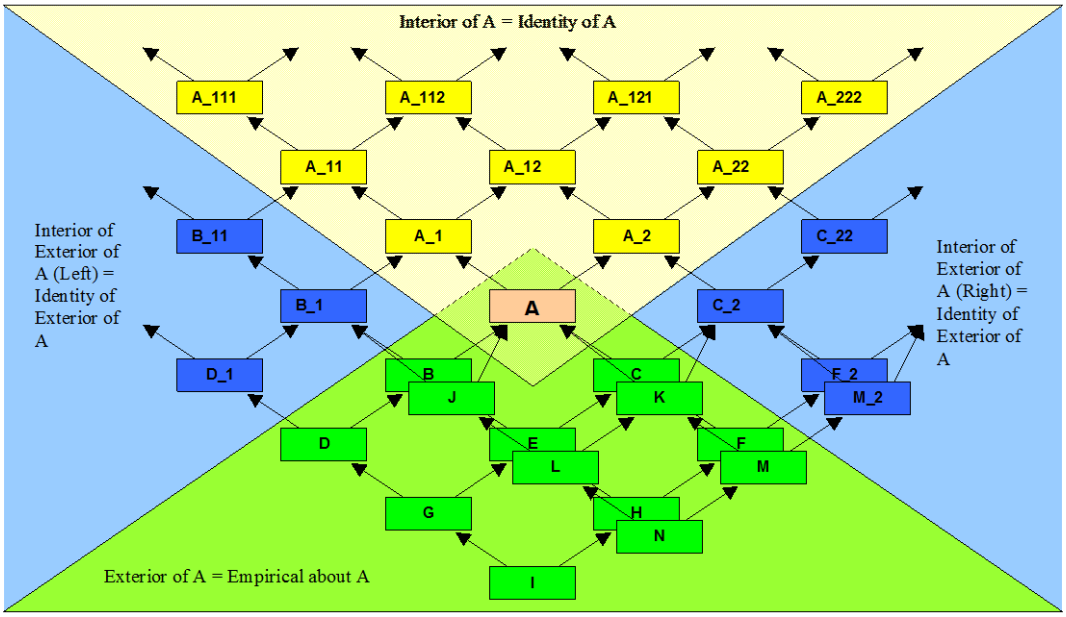


Figure 40.

This kind of *network structure* is eminently suited to representing information, propositions and languages. Some illustrations of how it models information entities (like tables, binary relations) are shown below. The point of this network here however is that it gives us a different kind of *whole-part relation*, illustrated in the topology above. There is a very simple underlying network *composition*, being a mosaic of network tokens or tiles, each with two 'strings' joining upwards (instead of just one for a tree structure), and as many strings joining below as desired. But although the composition is simple, it can represent information, propositions and language of any complexity (Three or four parents are needed for a computer practical system, to provide identity relations, based on common *denotation* and *functional construction*).

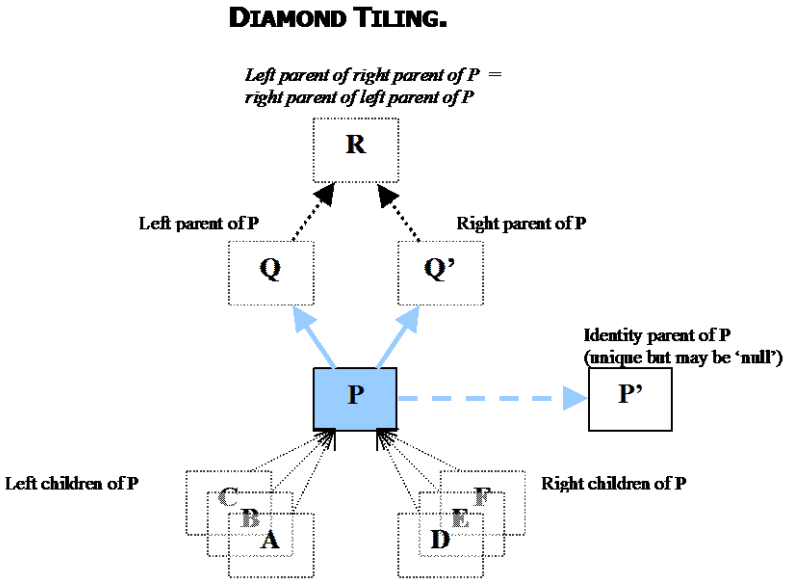


Figure 41.

It is relatively difficult to implement this structure *physically* in three dimensional space – it would require something like the highly filamented neural structure of the brain – but in the multi-dimensional space of TAU the connectivity can be direct.

This feature is important to recognise, since it allows TAU to embody language, intelligence, propositional representations, in an organic way, as long as such network mosaics can be internally constructed.

Below are illustrations from practical application of the *information representation structure* in question. Its key feature is that it is hierarchical upwards, but not in a simple way. Its width can expand and contract as you go upwards, but it eventually converges to a single point. It can also have any number of structures of the same kind inserted or embedded at any point. Since this (when equipped with a dynamic transmission between points via joins or strings) can be used to model or simulate any kind of database or computer program, and it also has a natural language modelling capability, there is no reason that the Aethereal Universe structures should not transform at some level into hierarchically organised layers like this, representing *propositional thought. 'Linguistic-propositional thought'* can be hosted in structures like this.

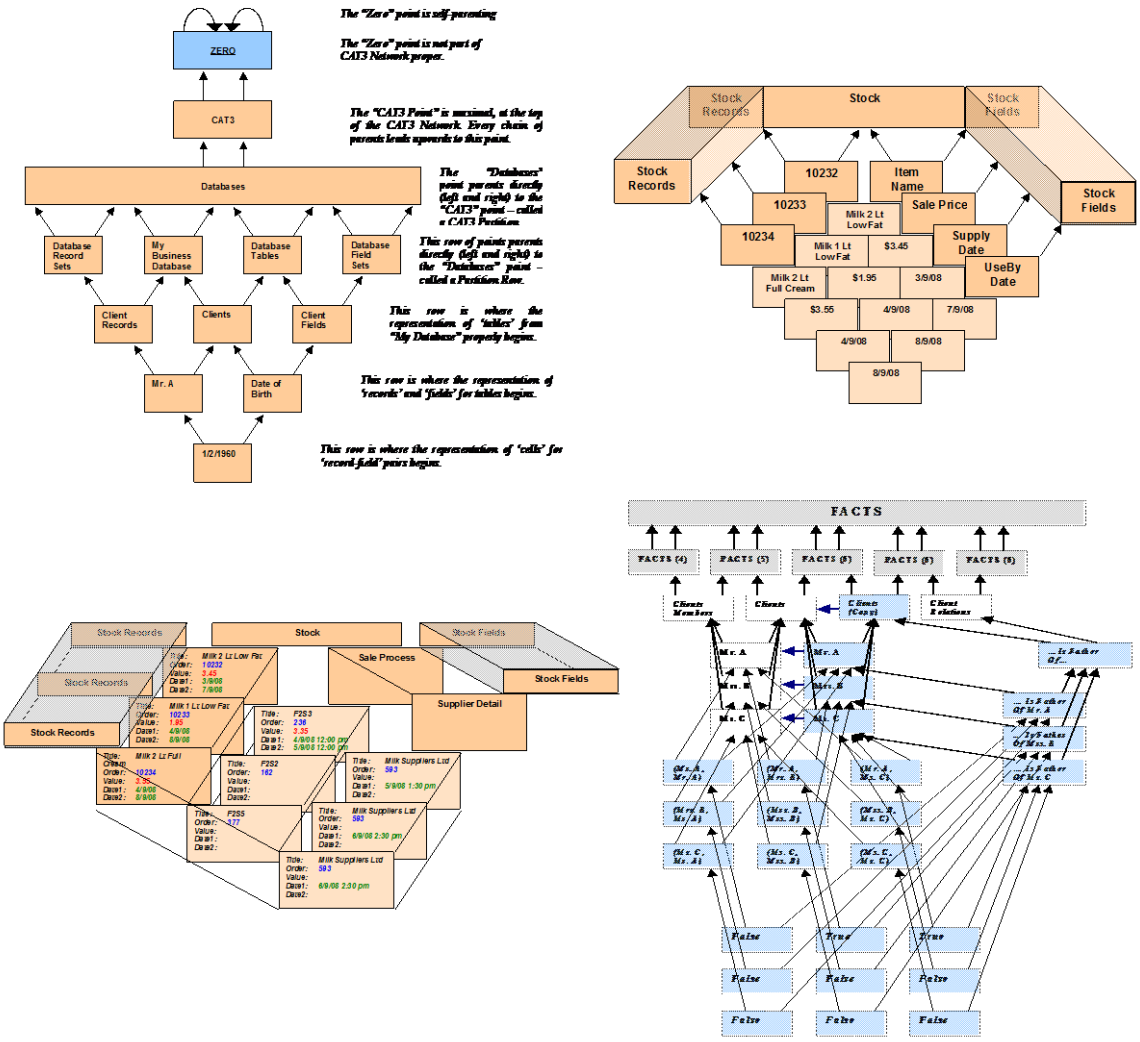


Figure 42.

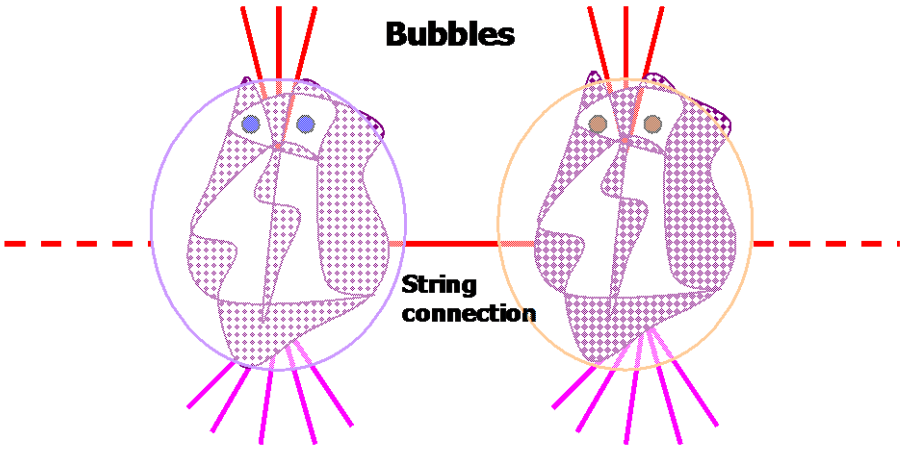
Graphic examples of representations using network mosaics based on *CAT2, CAT3 and CAT4 structures.*

18.5 Permeance of entities.

There are a small number of kinds of *entities* in the Aethereal manifold that immediately spring to mind. First, what I will call *bubbles in strings*, and *objects in spaces*, which are parts of holistic objects defined by their *shapes and harmonics*. There are *permanent string connections* and *semi-permanent string connections*, which are 'causal agents'. There are *structured motions* or *harmonics* – the expression of energy. And there is also a 'hologrammatic' structure, with images of entities found embedded in holistic higher-level entities, rather like memories.

18.5.1 Bubbles.

Bubbles are formed at the entanglement points. When we have billions of strings entangled, these may become 'sub-spaces' of five dimensions in their own right.



Bubbles are small *aetheral spaces*, containing holistic complex entanglements.

Is this where our 'phenomenal world' is hosted? Imagery and sensations created as *hyper-dimensional forms*.

Bubbles may be semi-permanent: do they endure if the connections below are dissolved?

Bubbles are like our 'phenomenal souls' rather than 'permanent spirits'. Their impermanence comes from their dependence on the surrounding *string structures*, and the fact that they are not embedded in a *permanent sub-space*.

String connections between individual bubbles are possible – but do they have real effects?

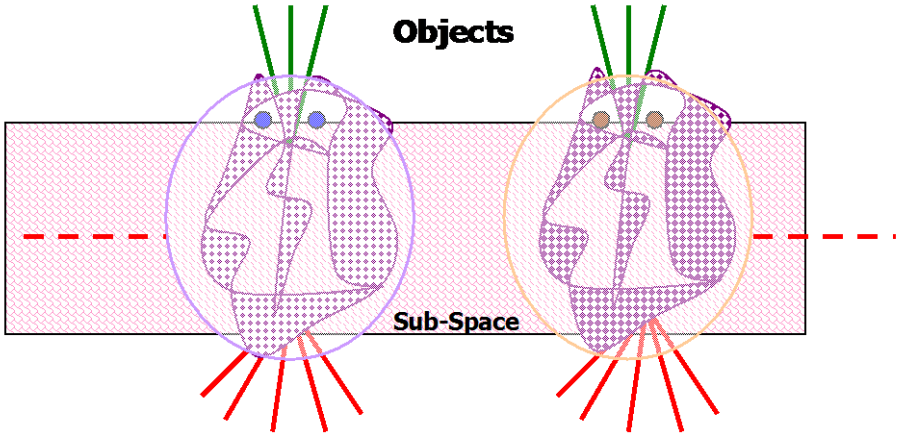
Bubbles can also connect indirectly through parenting or child string network.

The also connect through string harmonics, if they are neighbouring? Note that proximity in the aethereal space is not equivalent to local proximity in our physical space.

Figure 43.

18.5.2 Objects.

Objects are formed in *spaces*, which are lasting permanent structures. In TAU, these are all formed as 5-dimensional surfaces in 6 dimensions, but they will have different *dimensional ratios.* If four or five dimensions are 'blown up' instead of three (as in our physical world), then the bubble will represent information in four or five dimensional shapes. How would we experience these? Is our phenomenological space in which we construct our vision and so on really four or five dimensional *analogue space* of aether?



Objects are permanent entities hosted in extended sub-spaces. Within the sub-space they interact with other objects, as if their properties are independent.

Particles like electrons and protons are the *objects* in the particle level. These are semi-permanent entities: they may be created and destroyed, but undisturbed, they last almost forever.

Objects hosted in *sub-spaces* like this have energy and are most likely to be permanent entities, in contrast to *bubbles* or *harmonic entanglements*.

Spaces. There many possible *spaces* in the structure. We should ask:

Is there a *personal phenomenal space,* with complex objects representing our personal experiences?

Is there a *shared space of phenomenal objects* that we experience individually from another first-person identity above – like watching the same TV?

Is there a *personal spiritual space,* with permanent objects representing our ultimate personal identities or egos, without the content of experience?

Are there higher spiritual or divine spaces, that we can experience?

Figure 44.

If our 'personal identity' or 'spiritual identity' is identified with an *object in hyper-space,* then it has a much better chance of being permanent (after death) than if it is identified with an *entanglement.* However we do not know what such a sub-space may be like: apart from spiritual or psi experiences, our information is about our *physical-phenomenal world*, and there might be any kinds of entities in the space of our *spirits* that do not impact in the physical space and of which we are wholly unaware. What effect might they have on us directly in this space?

18.6 Consciousness and awareness.

So far we have a potentially rich structure of hyper-dimensional entities and structures, but we have no proposal about *consciousness or awareness or mind.* The idea is that consciousness and mind are 'hosted' by the Aethereal universe, and consequently our experiential structures reflect its structures. Our awareness seems able to move to different 'places', focussing on different areas of experience or thought. This induces our consciousness of these. TAU presently has no theory of what this *consciousness* is. It only provides correlates for entities. My *a priori* assumption is that *consciousness* might be induced in any part of the aether.

However TAU provides no more detail to go on from here. We now need to move beyond TAU, and consider observation and theories from other metaphysical traditions. I conclude with a summary of conclusions to the question posed earlier.

19. Metaphysical answers in TAU.

Metaphysical questions in TAU.

1. are we (persons) identified with permanent or impermanent entities (spirits)
2. are we reincarnated in future lives on Earth (reincarnation)
3. is there direct communication between non-physical, holistic entities (psi)
4. do complex non-physical entities exist autonomously without particles (spirits)
5. if so can they interact with our particle world (ghosts)
6. is formative information distributed through the structure (morphic resonance)
7. does order and information derive from a central intelligence (design)
8. is the universe as a whole alive or conscious (holism)
9. as individuals do we make contact with each other directly (love)

The answers (provisionally) suggested here are:

1. A structure of at least 3 levels, including a physical 'body', a phenomenological 'personality/soul', and a permanent 'soul/spirit', is required to model our 'naïve' sense of personal existence. In TAU, these levels are possible structures, and if so, it is likely that there are permanent entities, representing what we would call our 'spirits'. Our 'souls', in the sense of our personality and identity expressed in the material world, are the interface of our spirits in the public phenomenal 'theatre' of the world.
2. It must be possible to be *reincarnated*, since natural processes are repeatable, and TAU means we have been *incarnated* at least, once in a natural process.
3. There is communication via *string harmonics*, and potentially a large amount of information is kept in the *harmonics of the structure*, as opposed to the *join structure*. The harmonics are dynamic information, the join structure or shape is static information.
4. It is possible and likely that there are 'free entities' in higher manifolds, that do not depend on lower level entities for existence. From a physical point of view, energy could potentially be inserted or removed from one level to another. Entities able to control this might be extremely powerful.
5. TAU makes it possible theoretically for higher-level entities to project *phenomenological* holographic-like entities, that appear real to our phenomenal minds, without involving particles – and vanishing without trace. This is the postulate of a *phenomenological level of reality*. The physics of TAU also makes it possible for real intrusions of physical matter into our physical space, by exploiting the geometry of motion in the aether.

6. TAU makes it entirely feasible that formative information, resembling *morphic resonance,* will be distributed throughout the structure. It may be evident in harmonic forms, expressed in *patterns of memory deeper in nature,* that complex string entanglements can leave on each other's harmonics, or that *threads* between entities could also maintain.
7. TAU makes it entirely feasible that order and structure derive from a central intelligence. The proliferation of *life* in the universe is a prime example. Organising 'brute matter' into living organic forms via DNA and so on, is a way of turning matter into a form of living ecosystem, suitable to host *conscious beings* in the first-person experience of *being in a physical world as organic animals with minds.* This is a pretty awesome fact about the universe. Our world is strangely – almost surreally – rich in *order,* including meaning, history, symbolism.
8. TAU makes the universe something more than we could really imagine, but if it is driven and maintained in a form of *order* from a central intelligent structure, then the universe as a whole is like a living entity, with a consciousness and intelligence.

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Appendix. Quote from Fred Hoyle.

"A common sense interpretation of the facts suggests that a superintellect has monkeyed with physics, as well as with chemistry and biology, and that there are no blind forces worth speaking about in nature. The numbers one calculates from the facts seem to me so overwhelming as to put this conclusion almost beyond question."

Fred Hoyle, 1982. "The Universe: Past and Present Reflections", Annual Reviews of Astronomy and Astrophysics, 20 (1982), 16.

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Julie Halligan – Owner the Holy Grail bookstore

"On May 10, 1971 the renowned astronomer Fred Hoyle (1), the incumbent Plumian Professor of Astronomy and Theoretical Philosophy at Cambridge University, a position he had held since 1958, convened a small press conference to make a most unusual announcement.

> "Human beings are simply pawns in a great game, being played by alien minds, which control mankind's every move. These alien minds come from another universe, one with five dimensions. Their laws of chemistry and physics are completely different from ours. They have learned to shatter the time-space barriers that restrict us. These super-intelligent entities are so different from us that to apprehend them or to describe them in human terms is impossible. These entities seem to be totally free from physical restrictions such as bodies, and they are more like pure intelligence. They seem to have the ability to be anywhere in the universe in a matter of seconds. These aliens are everywhere – in the sky, on the sea, on earth. They have been here for countless eons and they have probably controlled the evolution of homo sapiens. All of what man has built and become was accomplished because of their 'tinkering' of the intelligent forces."

Professor Hoyle went on to say:

> "The only reason that I have called this press conference is that no government on earth would release this information. All governments fear panic among their people and think that if people knew the truth and knew some alien intelligent force and power is controlling them, that people would no longer listen to or obey their government."

"Certainly this is a most stunning pronouncement of disclosure from a former pillar of the scientific community, one that would most certainly have ended his career one would imagine. On the contrary, the following year Fred Hoyle was knighted by the Queen and was also the recipient of the most illustrious Royal Medal (also known as the Queen's Medal) from the Royal Society 'In recognition of his distinguished contributions to theoretical physics and cosmology" (Julie Halligan)

Footnotes.

[i] I have called the specific mathematical model for this *a geometric universe with time flow*. [http://philpapers.org/rec/HOLAGM]. I use *the aethereal universe* to refer to the more general conception of this kind of universe, or the *ontology* this model leads to. Others might propose a different view of the ontology from the same model, e.g. materialists might claim a reductionist ontology.

[ii] The idea of extra dimensions was proposed in the 1920s by the physicist Kaluza and the mathematician Klein, although the idea may be taken as a mathematical device rather than a realist interpretation of space. The Kaluza-Klein theory was ignored until the 1970's when it was resurrected with string theory. String theory is based on a 9 (or 10) dimensional physical space, (combined with time into a 10 (or 11) dimensional *space-time*). See Woit, *Not Even Wrong*, (2006) for a critique of string theory.

[iii] Fred Hoyle, the famous astrophysicist, called a news conference in 1971, and announced that we are controlled by 5-dimensional alien beings. This sounded ludicrous to scientists, but TAU makes it entirely plausible that we do have direct connections to '5-dimensional' intelligent entities.

[iv] David Bohm being the most famous. See discussion with Sheldrake (1982).

[v] Moreover, *if the theory TAU is true*, then TAU has far more powerful 'computational structures' than any of our computers can mimic; and it could surely mimic the *appearance* of a universe like TAU as an analogue model *within* TAU. (How would the simulations seem 'conscious'? However we seem conscious in the first place. We are not saying a *digital computer program* could be conscious). But this is a logical conundrum: an 'intelligent cosmos' like TAU must have the capacity to play tricks on us, to create virtual realities based on laws that are not the true laws, that do not refer to the true world. But then our 'reality' is almost inextricably 'artificial' – once we step outside of this artificial reality – what are we in *then?!*

[vi] The *torus surface* hosts two independent wave motions: circular waves around the major circumference, W_e, and circular waves around the minor circumference, W_p. The first generates the electron, the second generates the proton. These waves travel at the local speed of light, *c*, but their motion though ordinary 3-D space appears relativistic – and they have quantum properties.

[vii] This is a spin-1 particle, but electrons and protons are spin-½. In fact the lowest level wave mode is a half-wave rather than a full wave, giving spin-½ particles

[viii] Combinations and components of waves are used to construct other particles. It is possible to make the torus *hollow,* and have *quarks* as 'internal components', with the volume equation remaining exactly constant. The full interpretation of the Standard Model is yet to be done.

[ix] This model is made fully quantitative by specifying the *rotation speed as a function of time,* so that it reproduces the probability statistics for spin measurements. This is essentially: $sin^2(\phi/2)$ = *prob of catching in 'up' position = proportion of time in 'up' angle so:* $t(\phi/2) = A\ sin^2(\phi/2)$. *A* is a constant that converts to the *time metric.* This is the same type as the cardiod function in TAU – but in TAU, it relates *R* to *t,* here it relates in reverse: *t* to ϕ.

[x] This was made famous in the *Bell inequalities,* and the *Aspect, et alia,* experimental demonstrations in the 1960's.

[xi] It has been suggested there is some 'super-synchronisation', so *we are pre-determined to carry out the right measurements,* but this denies counterfactual freedom of action is real, and undermines all kinds of experimentation, and has no explanatory power.

[xii] This is because their geometric sub-space is one dimensional.

[xiii] These effects of curvature are a standard result in most conventional models of cosmology. But physicists traditionally avoid inferring a new dimension of curvature, instead maintaining an 'intrinsic space-time curvature' metaphysics. Note you must imagine travelling around the universe quickly or instantaneously, as an 'idealised observer' taking a snap-shot of its present spatial state. Given the universe is expanding, conventional space-time physics has no correlate for this.

[xiv] Note this determines the interpretation of the QM time reversal operator and CPT theorems, an issue that remains unresolved in conventional physics. It also solves the problem of missing anti-matter, a major asymmetry, by proposing that it is not missing at all. Note local galactic clusters would be expected to be homogenously made of matter or anti-matter. There should be very cold, unexpectedly empty voids between clusters, separating matter and anti-matter. So it all has empirical consequences.

[xv] Note that the quantum analysis, through the Bell inequalities, Aspect experiments, etc, shows that the *QM correlations at a distance* reflect some kind of ongoing *dynamic connection,* not just a pre-arranged correlation among fixed classical properties.

[xvi] See Goenner 1980 for details; Torretti 1996, p.326. This is seen in the Schwarzschild solution of GTR for a spherically symmetric central mass, which gives the black hole event horizon at a radius of $2MG/c^2r$, along with a naked singularity at *r=0.* The function for the *W-circumference* to represent this solution requires: $W(r) = W_0(1\text{-}2MG/c^2r)^{-½}$.

[xvii] Actually this is already prone to a logical confusion: *stars* and *galaxies* are the same logical type of entities (aggregations of matter), and a galaxy cannot be a *collection* of stars, because a collection is a logically different type of entity to a star. Rather, a galaxy *contains a collection of stars.* But it contains it physically, not logically like a set.

[xviii] Gary Zukav, 1979, *The Dancing Wu Li Masters*, and Fritjof Capra, 1975, *The Tao of Physics,* are the two best known popular writers to develop parallels between quantum mechanics and Eastern mysticism. David Bohm is another with deep interest in this connection. Many leading creative quantum physicists have had a lively interest in 'Eastern mysticism', attesting that quantum mechanics makes physical reality appear 'mystical', incomprehensible to mechanical modes of thought.

Wikipedia: http://en.wikipedia.org/wiki/The_Tao_of_Physics has this interesting quote:

> "Capra later discussed his ideas with Werner Heisenberg in 1972, as he mentioned in the following interview excerpt:
>
> > 'I had several discussions with Heisenberg. I lived in England then [circa 1972], and I visited him several times in Munich and showed him the whole manuscript chapter by chapter. He was very interested and very open, and he told me something that I think is not known publicly because he never published it. He said that he was well aware of these parallels. While he was working on quantum theory he went to India to lecture and was a guest of Tagore. He talked a lot with Tagore about Indian philosophy. Heisenberg told me that these talks had helped him a lot with his work in physics, because they showed him that all these new ideas in quantum physics were in fact not all that crazy. He realized there was, in fact, a whole culture that subscribed to very similar ideas. Heisenberg said that this was a great help for him. Niels Bohr had a similar experience when he went to China.' – Fritjof Capra, interviewed by Renee Weber in the book The Holographic Paradigm (page 217–218)

> "As a result of those influences, Bohr adopted the yin yang symbol as part of his family coat of arms when he was knighted in 1947. "

Wikipedia: http://en.wikipedia.org/wiki/The_Dancing_Wu_Li_Masters

> "*The Dancing Wu Li Masters* by Gary Zukav is a popular new age book about mysticist interpretations of quantum physics, first published in 1979. It was awarded a 1980 U.S. National Book Award in category Science."

[xix] From Holster, 2013, *The Time Flow Manifesto (unpublished).*

[xx] Kaluza-Klein theory in the 1920's and string theory since the 1970's use 'multiple dimensions' in mathematical models, but they do not propose realistic models like the 'aether', and do not infer anything about the general hyper-dimensional structures. E.g. Gribbon, 1993.

[xxi] The aethereal universe determines certain hyper-dimensional structures required to carry information, that we see 'mysteriously' reflected in quantum mechanics. But this is just the framework for the existence of the internal string structure. The full structure of the 'inner universe' now becomes an open question, and opens the door on the kinds of things and the universe might contain.

[xxii] TIL is intensional transparent logic, discovered by Pavel Tichy (1987). See TIL (Transparent Intensional Logic) Website.
http://www.phil.muni.cz/fil/logika/til/index.html