# Introduction

I wish to present to you a radical hypothesis that cuts to the very heart and soul of physics and science. At its core it is very simple and could poetically be described as the orthonormal to Relativity. I have come to call it "***The Theory of Bifurcation and Unification***" and reduced to its simplest form it states:

**The light cone of Relativity is the parabolic bifurcation and unification point between hyperbolic and elliptic spacetime geometries.**

Along with an equivalence statement:

**To stand inside a fundamental particle of nature is equivalent to being inside a black hole.**

And that is it!

It began as a simple idea, well over a year and half ago. Namely, by considering the output from the Big Bang singularity to be similar to that which we see and observe regarding black hole singularities. Since then I have tried in vain to nullify this idea but every time I went to look at the evidence it only grew stronger.

# One Singularity, Two Output Jets

In the beginning, approximately 13.8 billion years ago, there was The Big Bang in which the universe came into being from a single point of infinite density known as a gravitational singularity. In the case of the Big Bang, this is known as the initial singularity. A gravitational or spacetime singularity is a location in space-time where the gravitation field of a celestial body becomes infinite in a way that does not depend on the coordinate system.

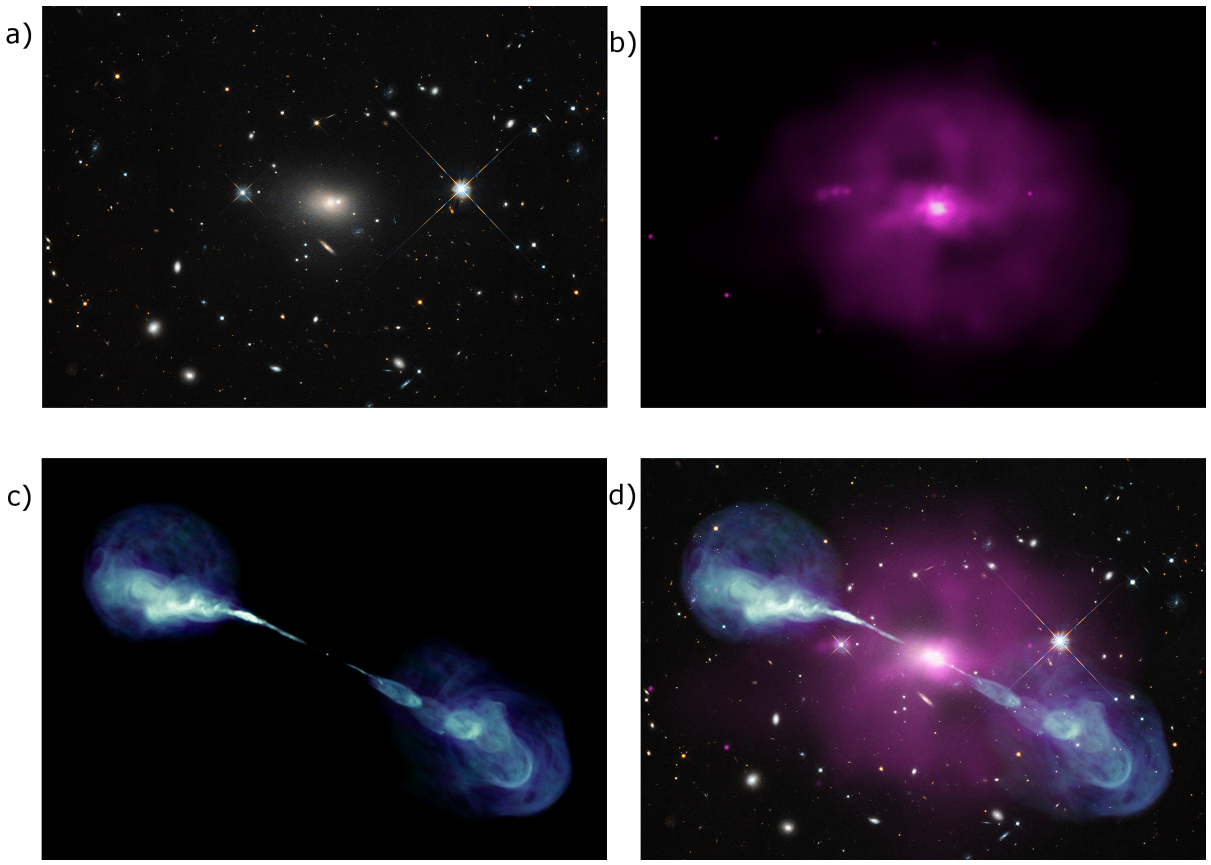


*Fig 1 : Images of Hercules-a 3c 348 galaxy. (a) Optical wavelength, Hubble Space Telescope Wide Field Camera 3. (b) X-Ray, Chandra X-Ray Observatory. (c) Radio, Karl G. Jansky Very Large Array (VLA) radio telescope in Mexico. (d) Composite image.*

Quasars were identified as being the brightest objects in the far off early universe. A quasar's luminosity is thousands of times greater than our own galaxy. Supermassive black holes, with a mass of hundreds of thousands to billions of solar masses, are to be found at the centre of almost all massive galaxies. A young active galaxy, or quasar, became so bright because of the heat generated by the material falling into the supermassive black hole at its core.

One analytical approach to understanding a system is to study both its input and output. Namely, the input being the galactic accretion disk and the output being the two jets travelling in opposite directions.

Images of the Hercules A (Galaxy 3C 348) active galaxy show's both this input and output in relation to the feeding supermassive black hole at the centre of the galaxy. In the optical wavelength, the galaxy appears to be a typical elliptical galaxy (Fig.1a). In X-ray light, however a giant cloud of multimillion-degree gas is detected (Fig.1b). This gas has been heated by energy generated by the in-fall of matter into a black hole that is over 1,000 times as massive as the one

at the centre of the Milky Way. Two jets spanning one-and-a-half million light years, aligned on the same spatial axis, each travelling close to the speed of light away from each other are visible in the radio wavelength (Fig.1c).

Thus, the input into a black hole singularity is the material that falls into it from the accretion disk. The output, are two jets travelling in opposite directions. From this insight the idea I now present to you was born and given shape.

Given that the Big Bang was a gravitational singularity and that the output from a known singularity, a black hole, is a pair of relativistic jets, or astrophysical jets, then we can suppose that our observable universe is one in a pair of jets. Namely, our observable universe, everything we know and see, is one of two output jets. The axis defined by the direction the jet travels in, as we'll come to see, defines the very arrow of time explicitly.

# Creation of Matter

Pair production (Fig 2) is the creation of an elementary particle and its corresponding antiparticle from a neutral boson. Examples include creating an electron and a positron, a muon and antimuon, or a proton and an antiproton.

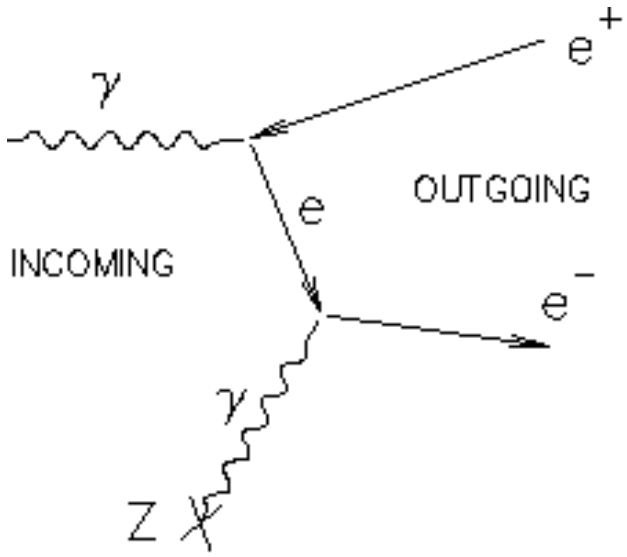


*Fig 2 : Feynman diagram of electron-positron pair production.*

Vice-versa matter is destroyed and converted into light energy in pair annihilation, such as when an electron and a positron collide resulting in pair gamma ray photons (Fig 3).

Of particular note, from Fig 3 is the fact that the resultant two gamma ray photons travel away from each other along the same spatial axis.

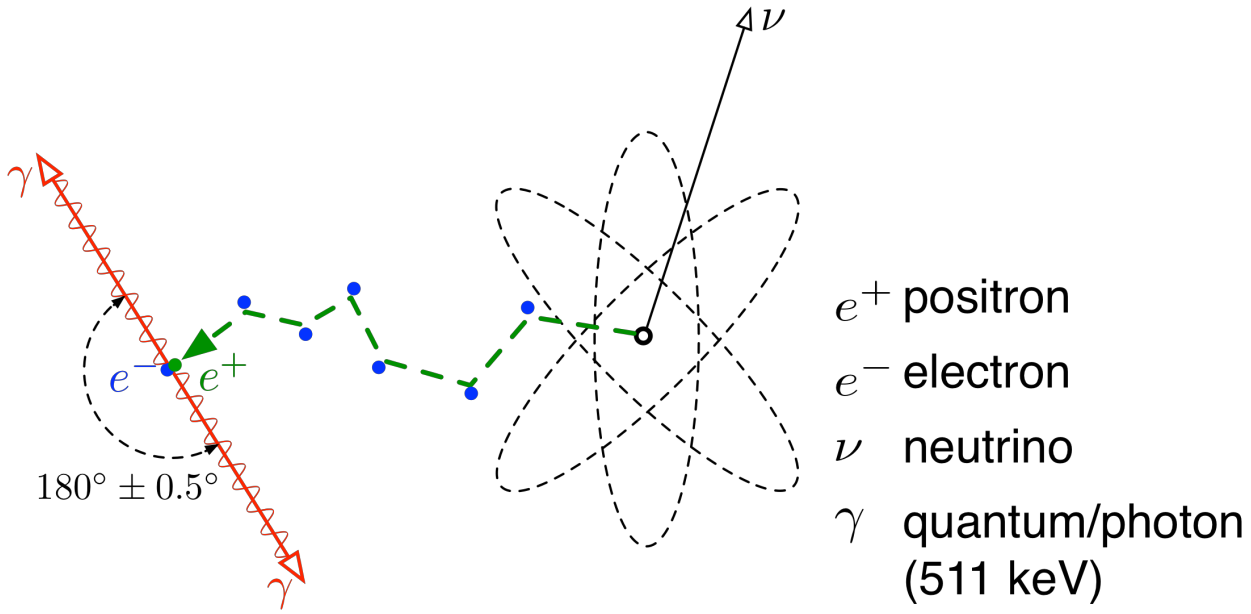


*Fig 3 : Naturally occurring electron-positron annihilation as a result of beta plus decay.*

Thinking about our two jets erupting from the Big Bang singularity they both travel away from each other in opposite directions. However, rather expanding into a spatial dimension the direction defines an axis and direction for the arrow of time.

# Axioms of Logic

In developing this idea, as a guide, I applied two philosophical axioms of logic.

1. The solution to the singularity is zero.
2. The curvature of vacuum is hyperbolic, the curvature of matter is elliptic and where they meet a parabolic Euclidean reality emerges.

The first axiom is based on the simple fact that our observable universe is finite. It is most certainly finite in time, starting 13.8 billon years ago, if not in space as well. So paradoxically how can points of infinite density exist when there is only a finite amount of matter? It can't, speaking as one who started asking these questions since my exploration of Hilbert and functional analysis at university.

My proposed solution is to place an equaliser, or balancing counterpart which when put together comes to nothing. The physics for my equaliser is pair production in the Big Bang singularity which produces opposite pairs that in turn will annihilate each other.

The second axiom works towards classifying everything as being composed of two different types of space-time curvature; that of vacuum or empty space; and that of matter, which is incompressible. Curvature of both the vacuum and matter are determined by Einstein field equations, a system of 10 coupled nonlinear, hyperbolic-elliptic equations.

Motivation for this approach comes from two different insights. Firstly, partial differential equations can be classified as parabolic, hyperbolic and elliptic. From studying finite differencing if an equation is parabolic it implies that information flow from one time step to the next will move inwards. Vice versa information flow when the equation is hyperbolic will move outwards.

The second motivation comes from the consideration of the light cone, shown in Fig 4, of special and general relativity as bifurcation point between hyperbolic and elliptic geometries. Parabolic or rather straight Euclidean geometry forms as the meeting point between these two geometries.

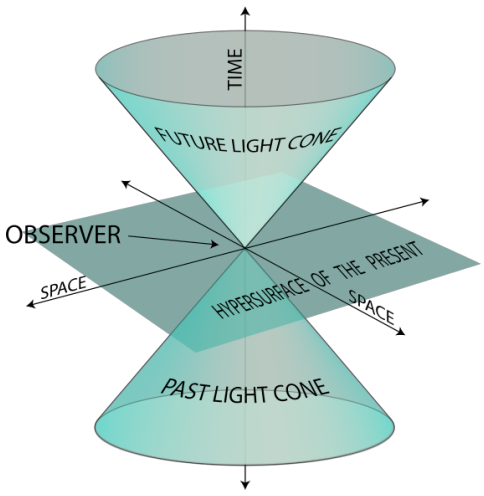


*Fig 4 : Light cone in 2D space plus a time dimension*

Fig 5 shows how the geometry of the light cone is bifurcation point between hyperbolic and elliptic curvature on a 2D manifold. The geometry of the cone in Fig 5 (c) is formed from the locus of the straight line equation, $y = x$, rotated around the y-axis.

The elliptic lobes in Fig 5 (e) are formed from the locus of two unit circles, translocated by a half along the y-axis, with equations:

$$x^2 + \left(y - \frac{1}{2}\right)^2 = 1$$

and

$$x^2 + \left(y + \frac{1}{2}\right)^2 = 1$$

Vice versa, the hyperboloid in Fig 5 (a) is formed by the locus of two circles of radius 2 translocated by 1 along the x-axis, with equations:

$$(x - 1)^2 + y^2 = 4$$

and the other half circle is formed by

$$(x + 1)^2 + y^2 = 4$$

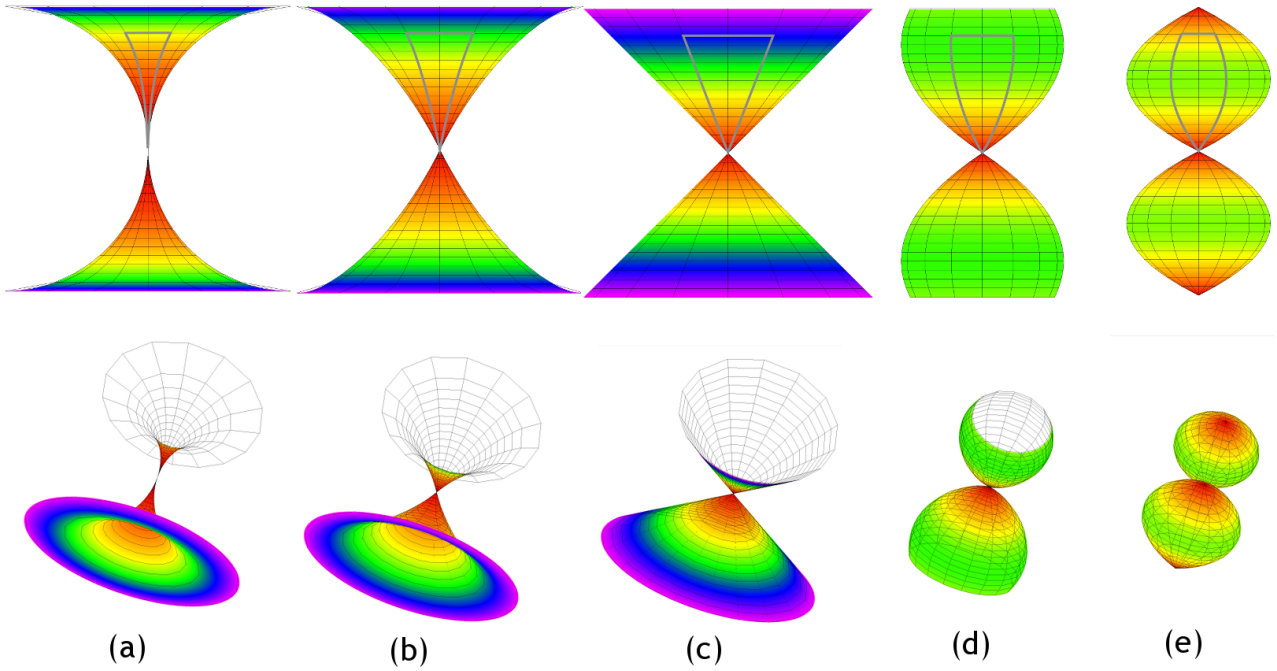


*Fig 5 : Light cone as the parabolic bifurcation point between hyperbolic and elliptic geometries. The upper images are an orthogonal view highlighting the curvature of a specific triangle. The lower images show the same rendering but from a perspective view. The spectrum colour denotes distance from the centre.*
*(a-b). Hyperbolic geometry where a triangle on the 2D manifold whose sum of its angles is less than 180 degrees.*
*(c). Parabolic geometry of the light cone where a triangle's angles on the cone's 2D manifold adds up to equals 180 degrees. (d-e). Elliptic geometry of the light cone where a triangle's angles on the 2D manifold is greater than 180 degrees.*

Note how the curvature of a triangle drawn on the surface evolves as the hyperboloid morphs into a cone and then into elliptic lobes. A triangle marked in grey on the orthogonal view, upper row of Fig 5, shows the evolution of the triangle's curvature as the geometry morphs. When the curvature is hyperbolic then the sum of the angles of the triangle is less than 180 degrees. When the curvature is elliptic the sum of the angles is greater than 180 degrees. And so, the two geometries

meet when it crosses over to form a cone and here the angles of the triangle add up to 180 degrees in accordance with Euclidean geometry.

And so, we can see how a cone is bifurcation point between elliptic and hyperbolic curvature. It is also interesting to note that "Minkowski restricted space-time to non-Euclidean hyperbolic geometry in order to uphold causality". When considering elliptic curvature time inevitably flows in a circular motion, forwards and backwards, eternally until the waveform collapses by observation. Or that, is how I currently picturing it, particularly from pondering about a more fundamental reason for slow light.

In short, we live and experience the world around as being straight, living in a Euclidean geometry. A world where two parallel lines will run off to infinity and never meet. This is the fundamental reason why. Straight is straight for a reason and this is the reason.

Another motivation concerning the hyperbolic curvature, or accelerative properties, of seemingly empty vacuum comes from the discovery of dark energy and the Casimir Effect. As more vacuum empty space expands into our universe, or the other way round being matter diffusing from a single mass into the surrounding void, so to does its accelerative effect.

# The First Bifurcation

Let us define point point zero (0,0,0,0), as being the precise infinitesimal point in both space and time where the Big Bang event took place and where its associated singularity point resides. Universally, this is the one and only absolute point of reference in both space and time, all else is relative.

We have seen that the output from a black hole's gravitational singularity are two jets travelling in opposite directions. Secondly, we have also seen that electron-positron pair annihilation produces two photons travelling in opposite directions. With this in mind, let us now consider pair production at point zero.

With pair production forming matter our observable universe came into existence. The output from the singularity, like a black hole, is two jets travelling in opposite directions away from each other.

With regard to input, two different conceptual models help us to picture the input into the Big Bang process, both motivated by nature. The first is to think of the input as an accretion disk, just in the same way the galaxy is the accretion disk for its supermassive black hole. The second is to imagine the birth of a black hole coming about from a massive star going super-nova with its core collapsing under its own weight. I prefer the second as we do call it The Big Bang, so it was a fast and violent process, not ongoing. Also the presence of the cold spot on the microwave background radiation adds weight to this.

Starting from point zero, our observable universe is born in the form of a jet, one of a pair. However, rather than traveling along a spatial axis our jet travels along a temporal axis. That is to say, the temporal axis defined by the direction of our jet is explicitly the arrow of time. Moving from point zero for $t > 0$ all the matter that forms everything in our observable universe exists. The concept of time existing before $t = 0$ does not exist, relative to our universe's real existence.

The opposite jet, travelling in the opposite temporal direction, is composed of anti-matter. That is for $t < 0$ a parallel universe of anti-matter comes into existence. Note that our universe does not exist for $t < 0$ and the parallel anti-matter universe does not exist for $t > 0$. So the two never come together or co-exist in the same region of spacetime and thus do not annihilate each other.

Now our universe's real existence happens when $t > 0$ and from our prospectus our twin universe of anti-matter does not exist. It is in effect literally imaginary from our prospectus as is ours vice-versa. Dirac's equation which predicted the existence of anti-matter is famous for its use of imaginary complex numbers.

The spin rotation of the opposite jet will be counter to our own travelling backwards in time. So what is the difference between matter and anti-matter? Nothing much. Very simply put, anti-matter is matter travelling backwards in time with counter-rotation.

Imagine if you will that we take a mirror and placed it at point zero with the normal direction of the mirror aligned with our universal jet, we would see the opposite reflection of our universe in that mirror. And that is exactly what we find with antimatter it is the mirror image of ordinary matter.

## Matter, Normal, Anti and Dark

Ultimately I'll argue that matter be it normal or exotic is essentially incompressible elliptic spacetime curvature as a result of irrotational flow. However the properties that matter exhibits depends on the relative space from which it is observed.

As already discussed, antimatter can be seen as matter whose rotational and temporal direction of travel is the mirror image to that of matter. Vice-versa in the verse of anti-matter, normal matter from our verse would be behave like anti-matter does in ours.

Dark matter on the other hand has no properties either in our verse or our anti-matter twin because it is matter outside the confines of both. However although it exerts no local physical properties on a galactic scale its gravitational or global presence can be observed via gravitational lensing.

*Fig 6 : The path of light from the distant galaxy is curved by the unseen dark matter, in effect creating a gravitational lens.*

# The Big Bang's Event Horizon

Using nature as our template in order to understand the mechanics that were involved in the creation and formation of our universe we again look at the behaviour of an active black hole, as artistically depicted in Fig 7.

*Fig 7 : Artist's impression of an active black hole fed by the surrounding accretion disc and its output astrophysical jet, one of a pair.*

Matter from the accretion disc is accelerated to velocities approaching the speed of light as it falls towards the black hole. Some of that matter, before it reaches the event horizon is diverted along electromagnetic streamlines such that it is ejected from both its north and south poles. The matter has enough velocity, travelling close to the speed of light, to escape the black hole's gravitational incline.

Another important factor to consider is that a black hole's event horizon has a known surface area and volume, dependant on its type. Because volume and surface area exist this implies that the formation of the two jets is physically separate, one occurring at each of the respective poles.

Picturing the same process but for the Big Bang: In my conceptual model cold dark matter is the view of matter outside our universe and this forms the input accretion disc.

If the Big Bang's singularity follows the same structure as that of a black hole then it implies the existence of an event horizon whereby if something crosses into it then it will never come out. In other words, rather than thinking about a singularity as being an infinitesimal point in spacetime of infinite density which we can never see or measure and more importantly be able to escape from; rather we view and analysis the singularity from the point of view of the defined event horizon which has surface area and volume.

In effect, the event horizon is bifurcation point between leaving our universe and whatever lies within and we can never know what lies inside by the very definition of what a black hole is. By extension, we view the singularity from which everything we observe was created as being an unknown volume with a spherical event horizon.

By extension of the same pattern and processes that cause a supermassive black hole to be so massive with one for every galaxy so to is the volume contained within the boundaries of the Big

Bang's event horizon. In fact, ultimately the massive volume contained here could be the same volume inside every black hole.

We may not be able to experimentally know but following the logic of fractal geometry we shall try to infer, in later sections, as well as using unreproducible evidence in order to catch a glimpse of what lies inside.

# Matter And Antimatter Never Meet

Scientific consensus is divided about what happened to all the anti-matter in the early universe. Basically, if matter and anti-matter come together they annihilate each other. As everything was together, before blowing up into the universe, then consequently the two annihilated each other given that they both existed in the same region of spacetime.

An imbalance in the kaon and anti-kaon particle pairs where for every billon particle pairs there is a single additional kaon particle without an anti-kaon pair. Because of this evidence the general consensus is that matter and anti-matter annihilated each other in the very moments after creation but because of this imbalance one particle in a billon survived to form our resultant universe.

In the idea, I forward here, I am saying that this never was or could be the case as from the formation of a given pair they never meet but rather start to exist from the first in two separate universes. But that is only considering one instance of pair production and in the formation of the universe it had to happen for every particle in our universe. What is stopping them from colliding with each other?

Firstly the properties of matter are dependent upon which verse it occupies. The process we view as the creation of our universe can be reframed to viewing it as a process where by matter changes its temporal direction of travel and rotation. Namely matter accelerates from the input accretion disc towards the massive Big Bang singularity. At this point the matter either falls into the singularity or is forced into one of the two output jets.

If the matter is in our jet then it appears as normal ordinary matter to us. If the matter travels along the opposite jet then it will become anti-matter because its temporal and rotational direction of travel is the mirror image of our own jet.

Ultimately there is no annihilation as the process is one of a continuous conversion flow from what we observe as cold dark matter into both normal matter and anti-matter. This difference is given form by changing the temporal direction and rotation of matter. Ordinary matter only comes into existence once it has the direction and rotation defined by the axis of our jet. As both jets are at opposite ends of the event horizon they do not meet and there output do not cross.

Hence there is no matter and anti-matter annihilation in the early universe.

# The Microwave Background and the Axis of Evil

If our observable universe is indeed a jet with a defined direction and orientation then evidence for this would exist. The cosmic microwave background radiation (CMB) is electromagnetic radiation left over from the early stages of the universe. The early universe was a white-hot opaque fog of hydrogen plasma in which photons were constantly being scattered by the electrons and protons within this plasma. Around 380,000 years after the Big Bang the opaque plasma had cooled sufficiently such that electrons bound to protons to form the first hydrogen atoms and in so doing these newly conceived atoms could no longer absorb the thermal radiation making the opaque fog transparent. With the photons decoupled this light, that we now measure, began its 13.8 billon year journey across spacetime.

In 1964, Arno Penzias and Robert Wilson from Bell Laboratories accidentally discovered the microwave background radiation emanating from every direction in the sky using the Holmdel Horn Antenna. Since then a series of missions and experiments have been conducted in order to map this radiation; from RELIKT-1, COBE, BOOMERanG, MAXIMA, and most recently the WMAP and Planck missions. It was initially expected, based on General Relativity, that the microwave background radiation would be isotropic, the same in all directions. However very small temperature variations, anisotropies, were found indicating that the universe is not quite so isotropic as initially thought. That is, the hotter a region on the microwave background the greater the mass of material in that region. Vice versa, the cooler a region the less mass of material in that given area.

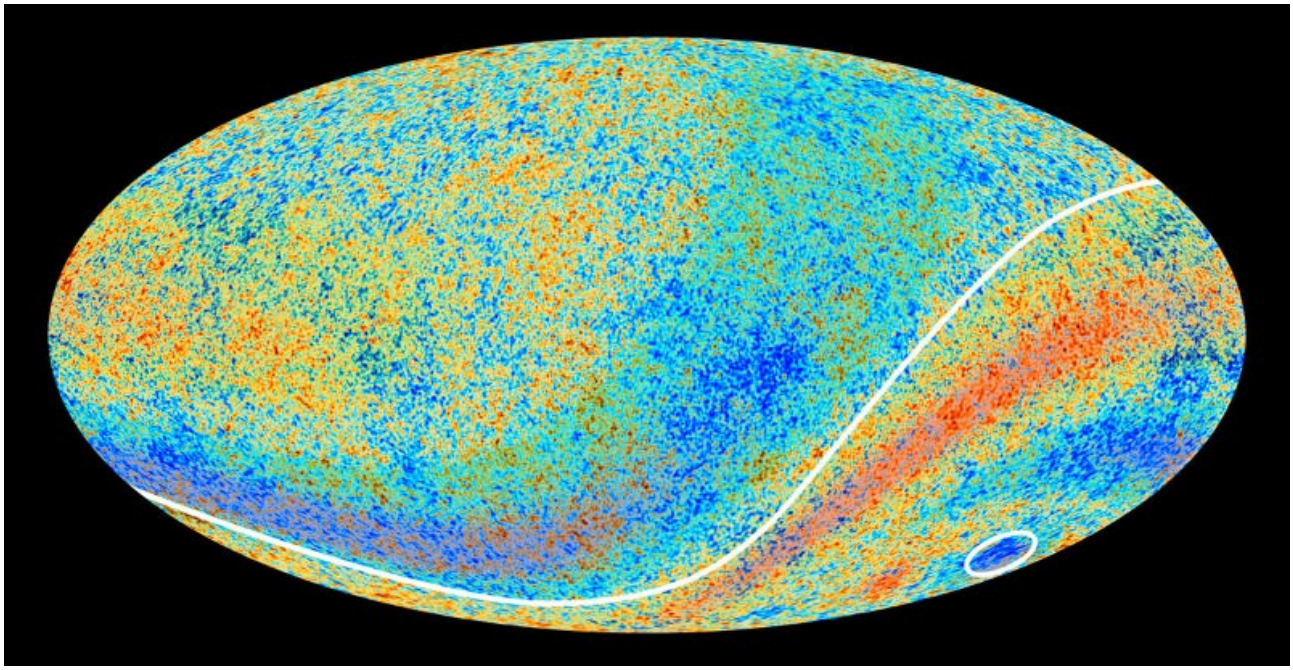

*Fig 8 : High resolution map of the cosmic microwave background radiation showing both the large scale temperature variation between the two axises. The white line running along the axis corresponds to the ecliptic plane of our solar system. The circle, in the lower right region, identifies an unusual cold spot.*

Dr. Dragan Huterer, has an excellent presentation describing the science behind the CMB.

One of the most disturbing and hence controversial results came first in the WMAP, but later reconfirmed by the Planck mission, is a large scale temperature difference between the two hemispheres. On small scales across the map temperature variation was found to be fairly uniform. However on larger scales, or rather lower frequencies, large scale temperature

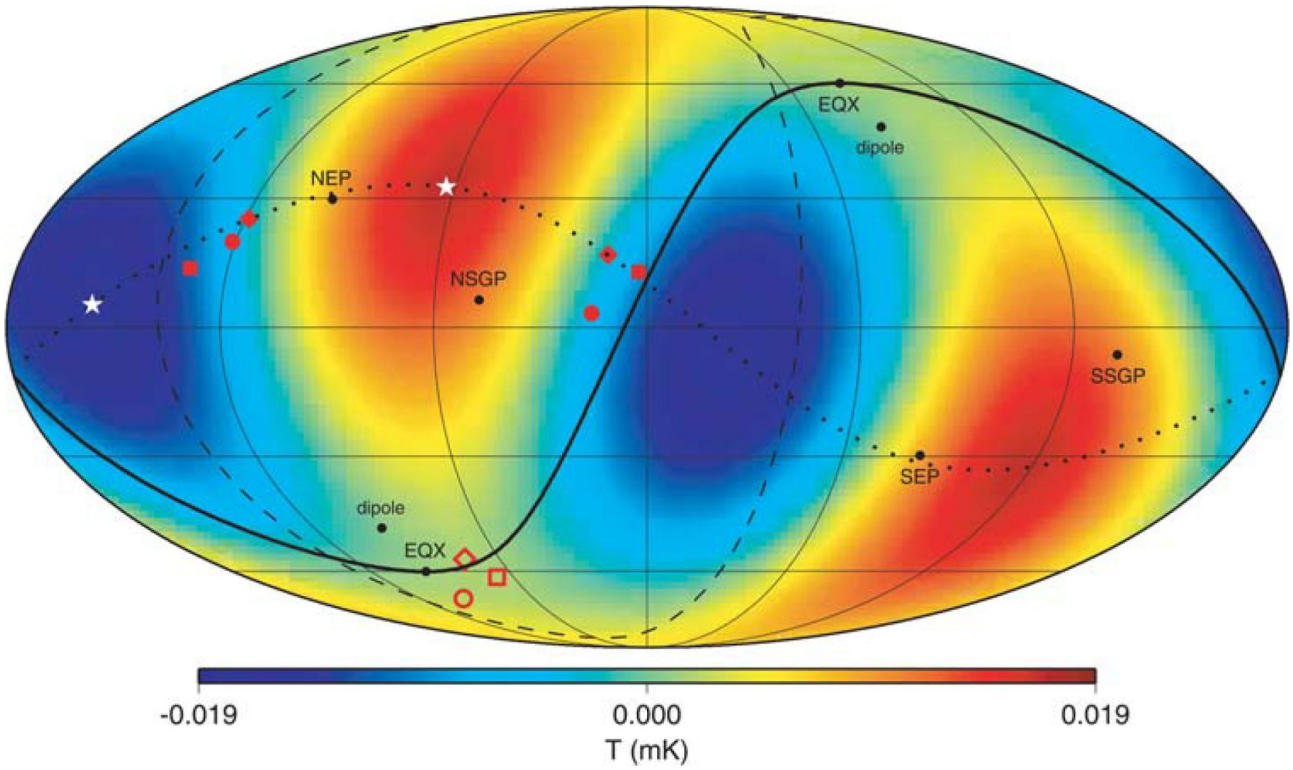


*Fig 9 : The l=2 multipole from Tegmark et al. (2003) cleaned map, presented in galactic coordinates, after correcting for the kinetic quadrupole, to account for our movement through the galaxy and universe. The solid line is the ecliptic plane of our solar system and the dashed line is the super-galactic plane on which our Milky Way galaxy lies.*

fluctuations were found and most shockingly was how it was aligned with the ecliptic plane of our solar system.

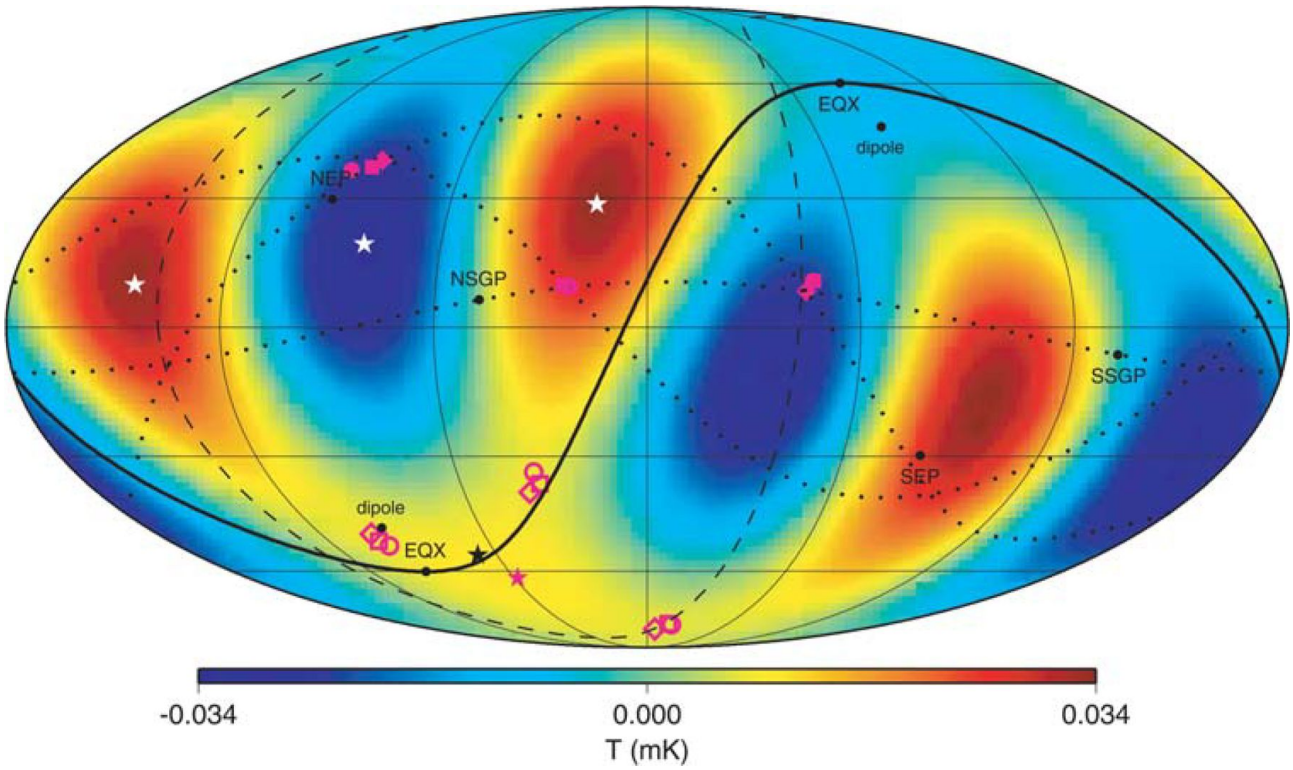


*Fig 10 : The l=3 multipole from Tegmark et al. (2003) cleaned map, presented in galactic coordinates. The solid line is the ecliptic plane and the dashed line is the super-galactic plane.*

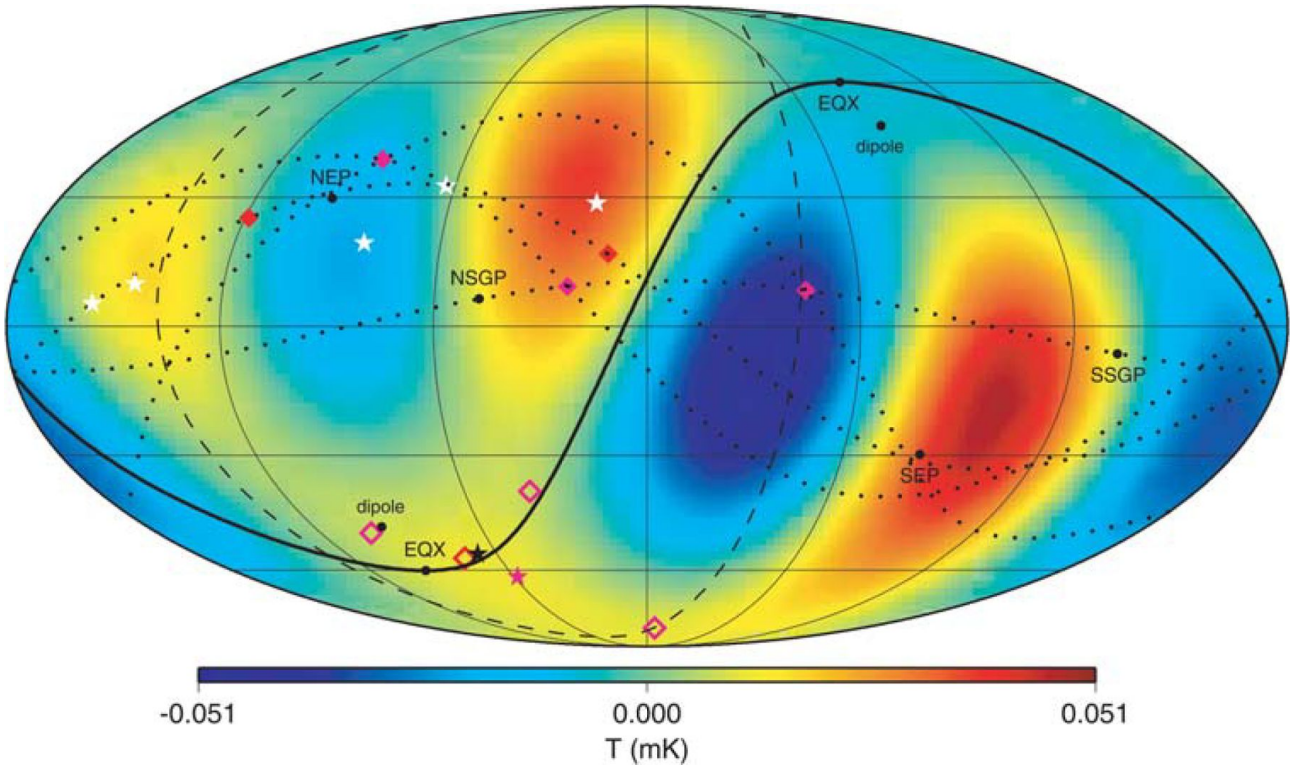


*Fig 11 : The l=2+3 multipoles from Tegmark et al. (2003) cleaned map, presented in galactic coordinates. This is a combination of Fig 9 and 10. The solid line is ecliptic plane and the dashed line is the super-galactic plane.*

As Fourier analysis is to the decomposition of a one-dimensional music composition so to is spherical harmonics equivalent but for a sphere. In short, spherical harmonics is employed to divine the frequency and spectral components of the microwave background radiation across different regions of the sky. Measured in integers, multipole vectors represent the different harmonics within a sphere. Tegmark et al (2003), published a series of maps showing that with a low dipole count the resulting multipole lobes are not statically isotropic as was to be expected.

The coincidence that the ecliptic plane of our solar system lies in such an orientation is very small and runs counter to the Copernican Principle. That is to say, there is nothing special about our solar system and thus its orientation and angular rotation are independent of the moment of creation. I agree with the principle in that I do not think there is anything special about our solar system with respect to all the other stars in our universe. However, if our universe is in fact an astrophysical jet, with an initial direction that later diffused as it expanded into the temporal void, then even at a local level that initial direction will be preserved. And that is exactly what we see from the microwave background radiation in its unexpected alignment to our solar system.

As a last note here, notice that in Fig 10 and more specifically in Fig 11 the number of lobes. Namely, there are 6 lobes in total running hot, cold, hot, cold, hot and then again to cold. As I will attempt to demonstrate in the next sections the result of Fig 11 is probably one of the most fundamental results ever in physics as it draws a direct link between cosmology and quantum mechanics. That is there are 6 quarks, there are 6 leptons and here we see 6 lobes.

# Bifurcation and The Black Hole

The idea of bifurcation, in summary, is about the division in the arrow of time and was originally given form when considering the Hawking's Paradox and black holes.

In essence a black hole is a small, infinitely dense, object of matter whose gravitational attraction is so strong that not even light can escape. The event horizon of a black hole is the boundary surrounding it where beyond which the escape velocity is greater than the speed of light. As nothing can travel faster than the speed of light anything that falls beyond the event horizon is effectively lost to the universe forever.

Imagine a hypothetical space traveller who is unfortunate enough to fall into a black hole. From the traveller's point of view they would see themselves fall in towards the black hole, crossing over the event horizon, before continuing the fall down towards the black hole's singularity.

Let's now imagine that the traveller's spaceship has a light that emits a flash every second and that this is witnessed by an external observer. At first the observer would see the light on the traveller's spacecraft flash once every second. However because of the relativistic time dilatation asserted by the mass of the black hole the observer would see the length of time between each flash increase as the traveller moves away from the observer and towards the black hole.

That is, the passage of time of the traveller, with respect to the observer, becomes increasingly slower and slower. Close to the event horizon, one second for the traveller is an eon for our observer. Ultimately, the observer will see the traveller approach the black hole’s event horizon but never crossing over it.

So how does my idea of bifurcation work to resolve this apparent contradiction in observations?

We have already seen how our universe of ordinary matter can be viewed as a relativistic jet. Further to this, the direction in which this jet travels explicitly defines the arrow of time. Now imagine a line that is orthogonal to the arrow of time’s direction defining another temporal direction. Actions occurring in this orthogonal temporal direction will not have any effect in our universe. Fig 12, shows this relationship of orthogonal time lines with respect to the traveller’s beacon as he falls towards the event horizon.

With our two orthogonal temporal axises defined we can view the relativistic time dilation exerted by a black hole as being a change in the temporal direction. That is, before falling into the black hole the temporal direction of our traveler is the same as that of our observer. As the traveller falls towards the black hole his temporal direction rotates away from that of the observer.

In essence it is say: the arrow of time moves directly forward in a region of pure vacuum and vice-versa the arrow of time moves directly in the reverse in a region of pure matter. That is, there is a continuous change in the direction of the traveller's arrow of time as he falls into the black hole.

So before falling into the black hole the traveller's arrow of time is pointing in the same temporal direction as the rest of the universe around it. Or more specifically, in the same direction as our observer.

At the event horizon the arrow or direction that time travels in can be viewed as being directly orthogonal to the universe's jet. That is, if some event took place at the event horizon then any effect caused by said event would not be felt or communicated in our universe. Rather the effect would only be felt on the event horizon itself and no where else.

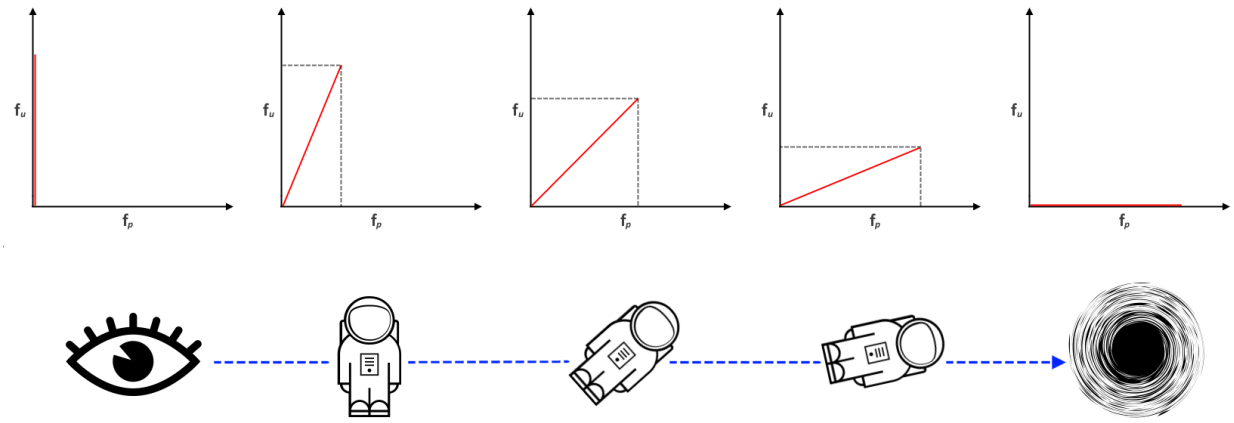


*Fig 12 : An external observer sees an astronaut falling towards a black hole. A light beacon flashes on the astronaut at a rate of 1Hz. The axises on the graphs are two orthogonal temporal directions; $f_u$ corresponds to the arrow of time followed by our observer; $f_p$ corresponds to the arrow of time followed at the black hole's event horizon. As the astronaut falls away from the observer the relativistic effect exerted by the black hole redshifts the frequency, relative to the observer, such that its frequency is reduced until it is almost, but never quite, nothing. Vice-versa at the event horizon one will see the astronaut come into view with the frequency of light increasing. And once at the event horizon the frequency of the beacon is 1Hz, relative to the event horizon. The arrow of time, relative to the astronaut, is the red line of the graph whose length is equal to 1Hz.*

Crossing over the event horizon the passage of time would appear to continue as normal. But now the temporal direction of the traveller would be back towards our past. In other words, the traveller's future is in effect our past and history.

At the event horizon the arrow of time runs orthogonal to that of the universe. That is to say the event horizon of a black hole is a surface area where any effect is preceded by the causation occurring within that surface area only.

In summary, the event horizon is the point of bifurcation between vacuum and solid matter.

# No-hair Theorem

Before looking at how bifurcation works to resolve the black hole information paradox we have to quickly mention the no-hair theorem which resulted in a 30-year long scientific debate in what Leonard Susskind, in his book, dubbed "The Black Hole War".

The no-hair theorem postulates that all black hole solutions of the Einstein-Maxwell equations of gravitation and electromagnetism in general relativity can be completely characterised by only three externally observable classical parameters: mass, electric charge and angular momentum. All other information about the matter which formed a black hole or is falling into it "disappears" behind the black-hole's event horizon and is therefore permanently inaccessible to an external observer.

As an example, suppose two black holes have the same mass, electrical charge and angular momenta, but the first black hole is made out of ordinary matter whereas the second is made out of antimatter; nevertheless, they will be completely indistinguishable to an observer outside of the event horizon.

As a note, given that we can view antimatter as ordinary matter whose arrow of time is reversed coupled with how the arrow of time is inverted in a black hole; then ordinary matter that falls into a black hole maybe transformed into antimatter. A simple analogy, with the exception that we have not accounted for anti-matter's counter rotation along with the rotation of the aforementioned black hole.

# Resolving The Black Hole Information Paradox

Black holes are sites of immense gravitational attraction. Classically, the gravitation is so powerful that nothing, not even electromagnetic radiation, can escape from the black hole.

Hawking radiation is blackbody radiation that is predicted to be released by black holes, due to quantum effects near the event horizon. Thermal radiation contains information about the body that emitted it, while Hawking radiation seems to contain no such information. Rather it depends only on the mass, angular momentum and charge of the black hole, by the no-hair theorem.

An important tenant of quantum mechanics is that information is always preserved. But a black hole emits Hawking radiation whose information has previously been lost to this universe. Hence, the information paradox.

Ultimately, over a very long period of time the black hole will radiate enough Hawking radiation that it will evaporate completely. That is, over trillions of years a black hole will evaporate and all the information that fell into it will be destroyed. This destruction of information runs counter to quantum mechanics tenant that information is always preserved.

Returning to my description of bifurcation in the arrow of time let us consider the fate of our unfortunate traveller. From the external observer's point of view the traveller never ever reaches the event horizon or crosses it. Rather the traveller's information is stretched and spread out across the surface area of the event horizon as they are spaghettified.

The traveller on the other hand continues in across the event horizon and once across the arrow of time now points in the other direction with respect to ours. Namely, inside the black hole the traveller's future is our past and the further he travels inside the further back in time he goes.

Eventually they will have to travel so far back in time that they reach the moment of creation. Now as any black hole in our universe was originally a physical product of our universe and contained within our confines then it implies that as we travel nearer to the moment of creation so to does the confines of space. Meaning that if the traveller falls far enough back they come back to point zero (0,0,0,0).

It is at this point the information that is our traveller can be thought of as being recycled back into the next evolution of our universe. Or rather, a black hole is a spiralling vortex that feeds from its mouth, at the event horizon, back down through time until at the very beginning of time it acts to feed the input accretion disc of the Big Bang's singularity. In addition, to support this view, we have not observed any white holes pouring matter out into our universe, with one exception, The Big Bang.

Ultimately, the information is lost to our observable universe but it is not destroyed. Rather it is recycled possibly into the next evolution of our universe.

As a last note my idea ultimately has many parallels with both the Holographic Principle, with a twist, and Conformal Cyclic Cosmology. We will return to these similarities but first we need to see more of the picture.

# The Temporal Horizon

So far we have discussed how the temporal direction of the event horizon, the spherical surface area around the black hole, is orthogonal to the surrounding universe. In effect we could call the event horizon a temporal horizon. But let us now explore and define another kind of temporal horizon by considering a galaxy that is accelerating away from us because of dark energy.

So far I have used the phrase observable universe loosely in talking about our verse of ordinary matter. Rather our observable universe comes from that light that has managed to reach us. In effect, a spherical region whose radius is 13.8 billon years, the time since the big bang, is all we can see and measure.

It was discovered by measuring type-1a supernova in distant galaxies that our universe is not just expanding but rather galaxies are accelerating away from one another. This means that a galaxy accelerating away from our own Milky Way galaxy will become increasingly red-shifted as it travels faster and faster, accelerating, away from us. Eventually, it will move so far away from us that its distance in light years will be greater than the age of our universe.

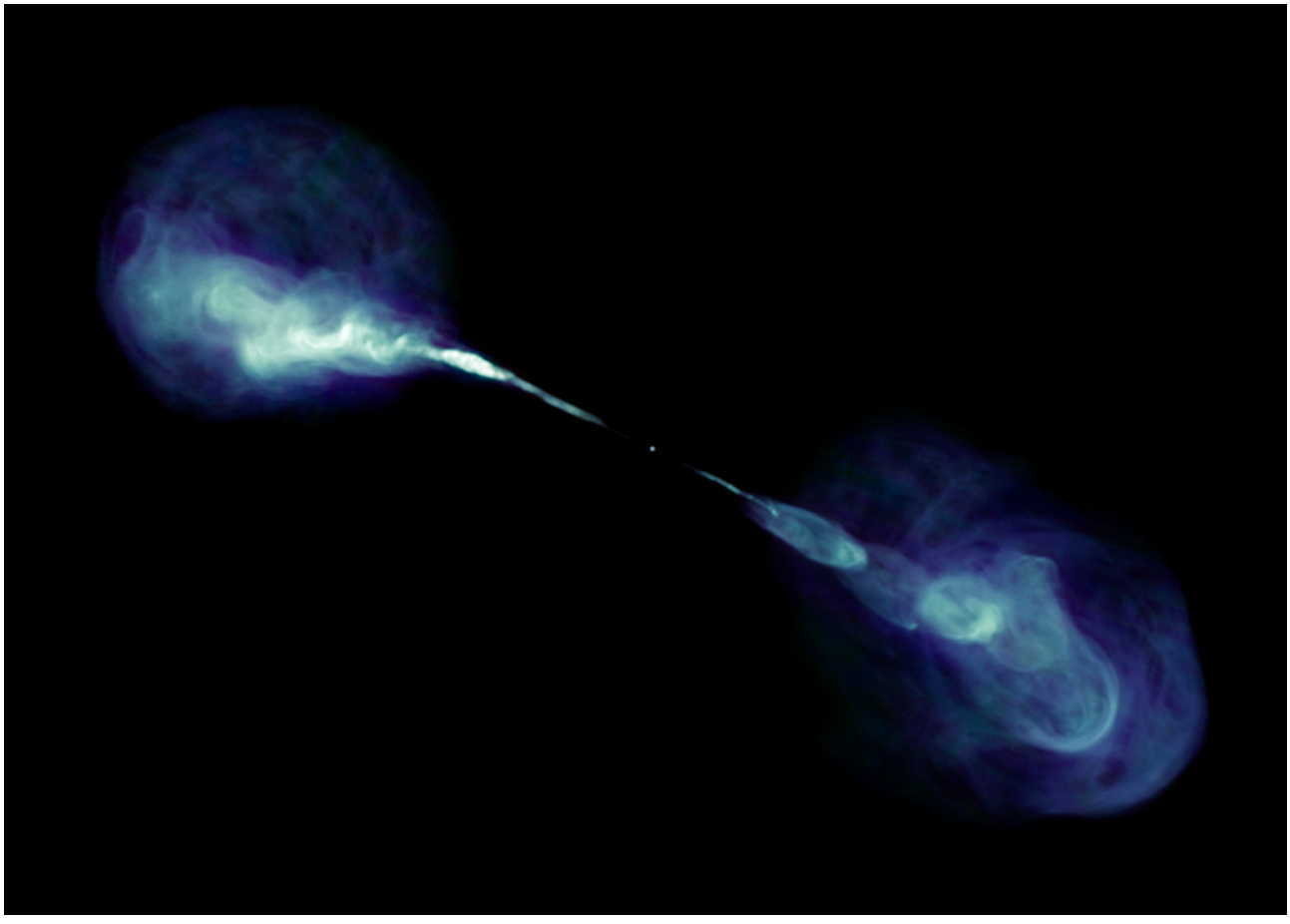

*Fig 12 : Radio of Hercules-a 3c 348 galaxy showing the relativistic jets formed by the active super massive black hole.*

That is to say, the galaxy we had observed accelerating away from us has travelled so far away from us that its light no longer reaches us. It is has crossed over a temporal horizon.

Let us again consider the picture of the relativistic jets from the Hercules galaxy, as shown in Fig 12. Originally, close to the black hole, the diameter of the material in the jet is very narrow as they are tightly bound. But further out this material increasingly becomes more diffused with the void.

Like, exactly what we see here in turn we can imagine our universe starting out of as pure jet of matter that breaks open and into which more and more void diffuses. But the critical difference is that the surrounding void is one of temporal dimension rather than spatial dimensions.

Whereas in the beginning the direction and arrow of time of everything was explicitly given form by the trajectory of the jet. As opposed to now where the jet of ordinary matter has diffused with the surrounding temporal void and rather the temporal direction of something is more a local property. But critically, the value of this local property is as a result of the initial conditions imposed upon it by the original direction of the jet. This couples back to what I said about the violation of the Copernican Principle in regards to the Axis of Evil.

Another point of view, is considering how galaxies form along their own arrows of time, that are different to our own, but all of which had the same initial direction in the very early universe. Like, the traveller falling into a black hole whose light emission increasingly become red-shifted; so to is the exact same principle involved as a galaxy accelerates away from us until it passes across a temporal horizon that is orthogonal to our temporal direction.

## The Bifurcation of Force

The idea at the heart of bifurcation is this binary notion that the geometry of spacetime forms either matter, when its curvature is elliptic, or vacuum with hyperbolic curvature. In turn, in describing the birth of our universe of matter I have forwarded the idea that our universe is one of two relativistic jets whose direction is a temporal one. Furthermore, in discussing what happens inside a black hole we have seen how matter is recycled by falling back in time to the beginning of creation, as we know it, and recycled into the next potential evolution of our universe.

Bifurcation, the division of something into two branches or parts, here refers to the division of a body of matter such that vacuum exists between the two, but now separate, bodies of matter. The analogue to this is how our relativistic jet broke apart from a single body of matter into a number of concentric bodies which in reverse is considered the unification of force.

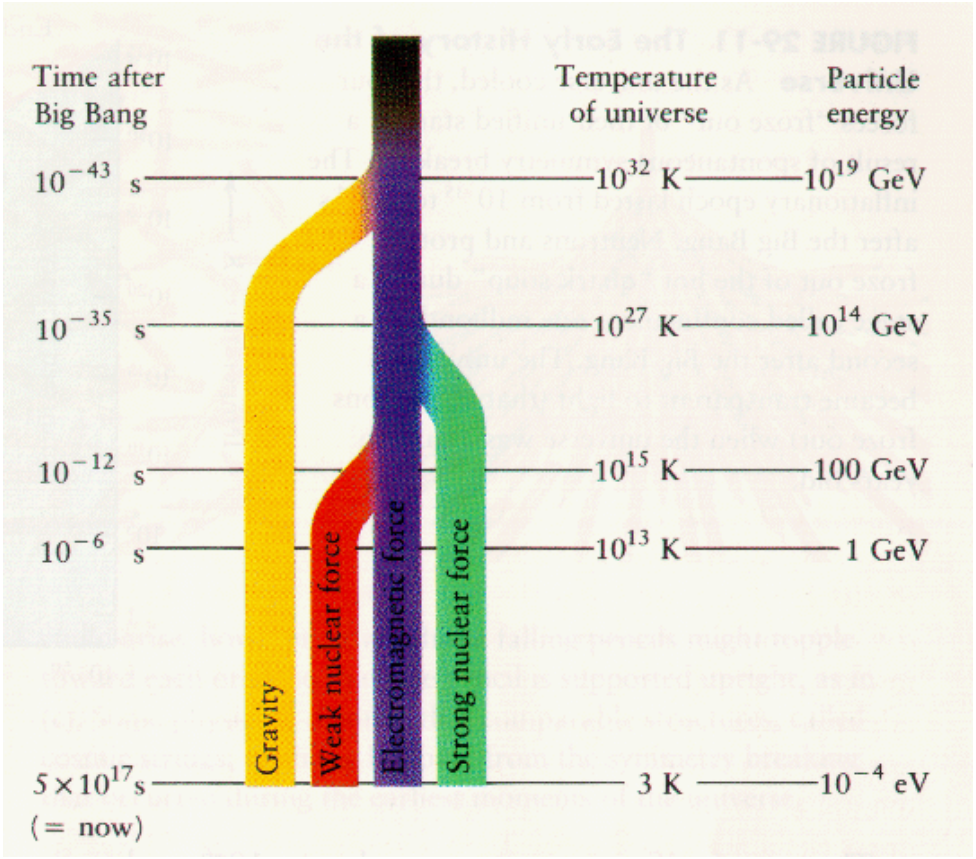


*Fig 13 : Separation of the four fundamental forces of nature in the moments after the Big Bang*

A Grand Unified Theory is a model where the four fundamental forces merge into a single unified force. Fig 13 shows this separation of the forces in the moments after the Big Bang. In my model this spontaneous symmetry breaking, or rather bifurcation, is because our jet of matter broke into a series of concentric bodies of matter. Ultimately, I will go onto argue that this structure is what causes us to experience the world we live in, but first lets see this division step by step first.

Fig 14 shows the different cross sections of our universe's jet as it divided, breaking into a concentric series of rings. Starting at $10^{-43}$s our entire universe of ordinary matter is one single body of matter, Fig 14(a). At this point the entire jet hits a point of bifurcation in the dynamics of its

flow and the single body of matter splits into two bodies, the cross-section seen in Fig 14(b). The specific reason for this bifurcation is best given form when we discuss The Higgs Mechanism.

As nothing exists between the two bodies it is by definition vacuum. Into this vacuum, force is born for the first time, united as a single force. That is, the electromagnetic, weak and strong nuclear forces are a single force because they are caught in the single vacuum space between the two bodies of matter, Fig 14(b). Secondly, the outer layer at this point here is, or will become, the outer edge of the universe. As strange, or inside out, as it may sound this body of matter to our eyes probably formed the supermassive black holes that were the seeds for galaxy formation.

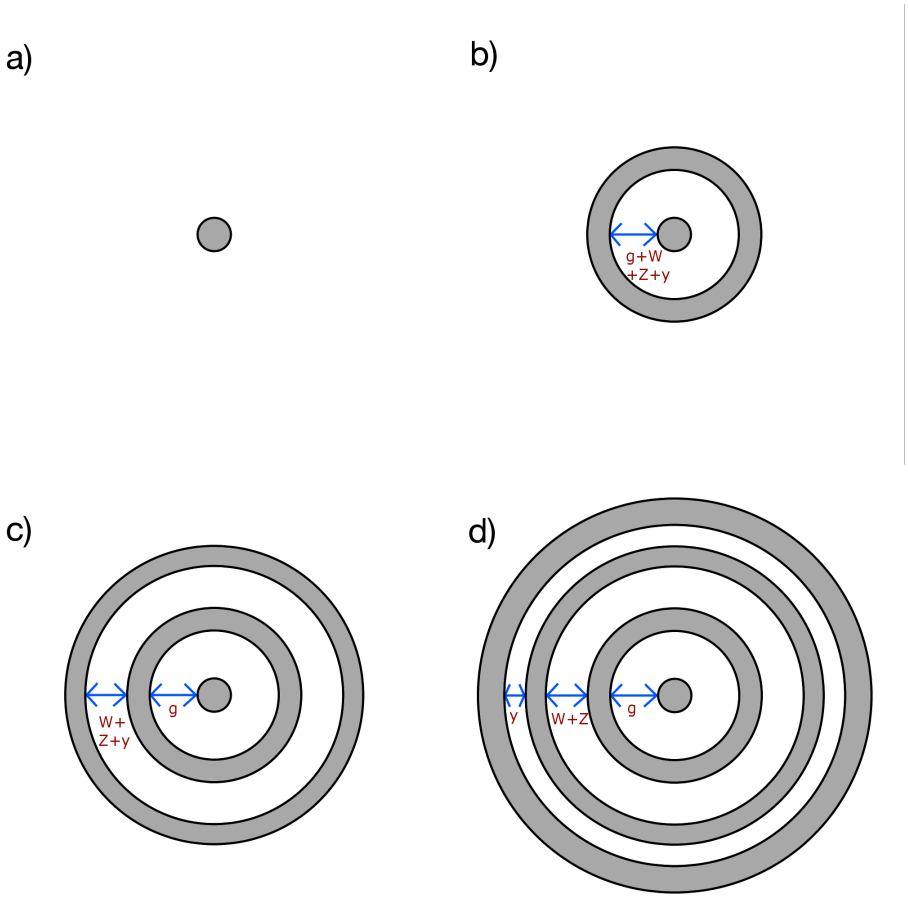


*Fig 14 - Cross-sectional views of the relativistic jet at different stages in its formation. a) At $10^{-43}$s the jet is a single body of matter. b) At $10^{-35}$s the jet breaks into two bodies of matter and force comes into existence and the outer edge of our universe is defined. c) The inner body of matter divides giving rise to the strong nuclear force. d) The middle body of matter divides with the inner layer forming quarks and outer layer forming leptons.*

Continuing on, further bifurcation of the inner jet of matter gives rise to another vacuum space. Because of this the unified force in the single vacuum space is divided, Fig 11(c). The strong nuclear force comes into form in the inner most vacuum space, and the electro-weak force in the outer vacuum space.

The last division, results in two new bodies of matter with the inner forming quarks and the outer forming the leptons, Fig 11(d). Again this bifurcation and opening of a new body of vacuum gives rise to the breaking of the electro-weak force into the electromagnetic and weak nuclear forces.

So, contained within the outer most circle of matter we exist along with the rest of the universe of ordinary matter. Additionally, we can view a force as occupying a body of vacuum enclosed between two bodies of matter. The three fundamental forces; electromagnetism, weak nuclear and strong nuclear are just that except they occupy different bodies of vacuum. Equally, in reverse, the unification of two bodies leads to the unification of force.

As an addition, we have only talked about bifurcation so far in trying to define it. But this is both

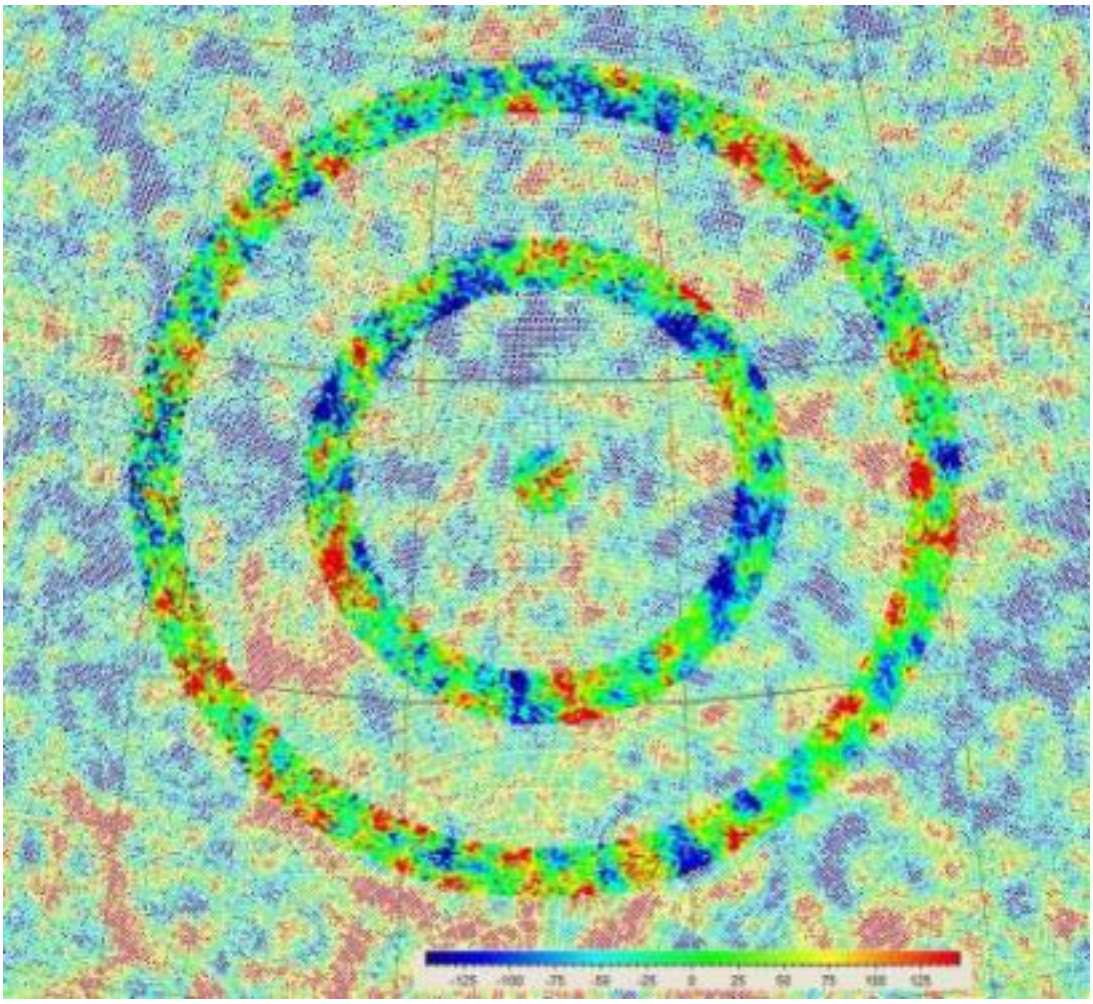

*Fig 15 - The three concentric circles feature, as identified by Penrose's team, on the Cosmic Background Radiation*

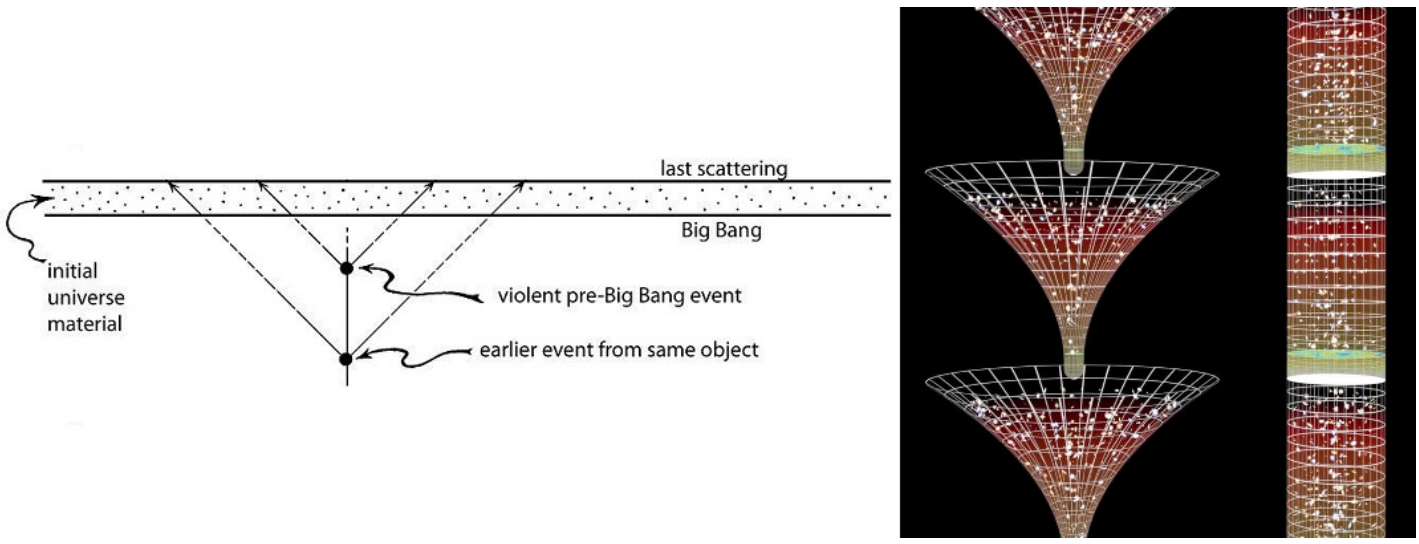


*Fig 16 - In Penrose's Cosmic Cyclic Cosmology the universe is reborn over aeons and the violent Big Bang events of these previous universes is seen as the cause for the circles on the CMB. The diagram on the left illustrates how these previous events come to be seen on the CMB. On the right a geometric representation of CCC. In my idea rather than pre-existing Big Bangs these circles are caused by bifurcation in the bodies of matter.*

the Theory of Bifurcation and Unification and it is here we get to see a definition of unification in that two bodies merge to become one. We'll return to this idea further when considering the collapse of the waveform equation.

Evidence of this process can be seen in the Cosmic Microwave Background radiation as a series of three concentric rings as shown in Fig 15. Like the Axis of Evil feature, mentioned earlier, it should be noted that this evidence is slightly controversial. Roger Penrose and Gurzadyan introduced the idea of conformal cyclic cosmology, CCC, where in it he proposed the existence of earlier universes before our own. The given reason in CCC for the concentric rings is due to violent pre-Big Bang events, as pictured in Fig 16.

Although controversial, in analysis of CMB data it is important to note that the analysis is tuned to the given conceptual model under analysis, like the standard Lambda-CDM model for instance. Given that I describe a different conceptual model of our universe whose closest overall model is Penrose's CCC then I think this evidence is rather convincing. This conviction is only reenforced when we look at a similar storm system in nature later on. Additionally, we have already discussed the mechanism by which matter is recycled back to the very beginning, via falling into a black hole, such that after an aeon a new universe will be born after ours has been recycled.

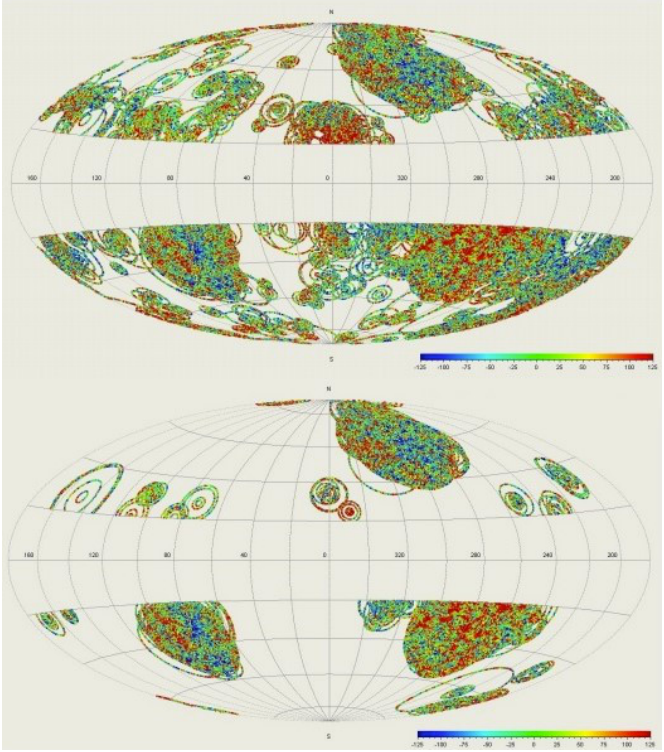

*Fig 17 - The concentric circles that have been identified*

In the context of the idea I present here, I would argue that these violent events were caused by the bifurcation process, as described above. That is, the violent events from the bifurcation of the original single body of matter into a series of four concentric rings of matter. As the outermost ring defines the boundaries of our universe we are thus contained within its envelope. Hence we only see three concentric circles on the CMB and not four.

Lastly, given that this series of bifurcation events was global through out the jet of ordinary matter and we are contained within then it implies that we should see this feature of the CMB all over the night sky. And this seems that this might be the case as shown in Fig 17.

## Bifurcation Is Flat

Returning to my initial consideration that the light cone of the Lorentz Transformation is the bifurcation point between elliptic and hyperbolic geometry and its exact crossing point is parabolic. The fundamental reason, I here argue, that we live in a universe where straight is straight such that two parallel lines can run to infinity and never meet is precisely because of this.

To this end, when bifurcation occurs such that the single body of matter divides into two bodies it is brought about by the change in spacetime curvature. Namely, in the single body of matter the elliptic curvature crosses over into hyperbolic curvature. As hyperbolic curvature of spacetime is in fact a vacuum then the physical result is the division of the body of matter in two. More importantly here, is that the curvature of where these two bodies meet is in actual fact flat.

Thus, in order for the idea of bifurcation to be valid then the curvature of space as measured against the CMB would be flat for this very reason. If there is one thing the scientific community agree upon from analysis of the CMB is that it does indeed show the curvature of our universe to be flat.

Space is flat because the point of bifurcation, caught in between hyperbolic and elliptic spacetime curvature, is parabolic. This parabolic curvature is equivalent to the resulting Euclidean geometry that makes up the reality we know and experience. The evidence from the light of creation when measured shows this to be the case. Space is flat!

## The Cold Spot and Dark Flow

The cold spot of the CMB, shown in Fig 18, is an unusually large void of empty space that is too big to be a statistical anomaly. If indeed our universe is an astrophysical jet arising from around

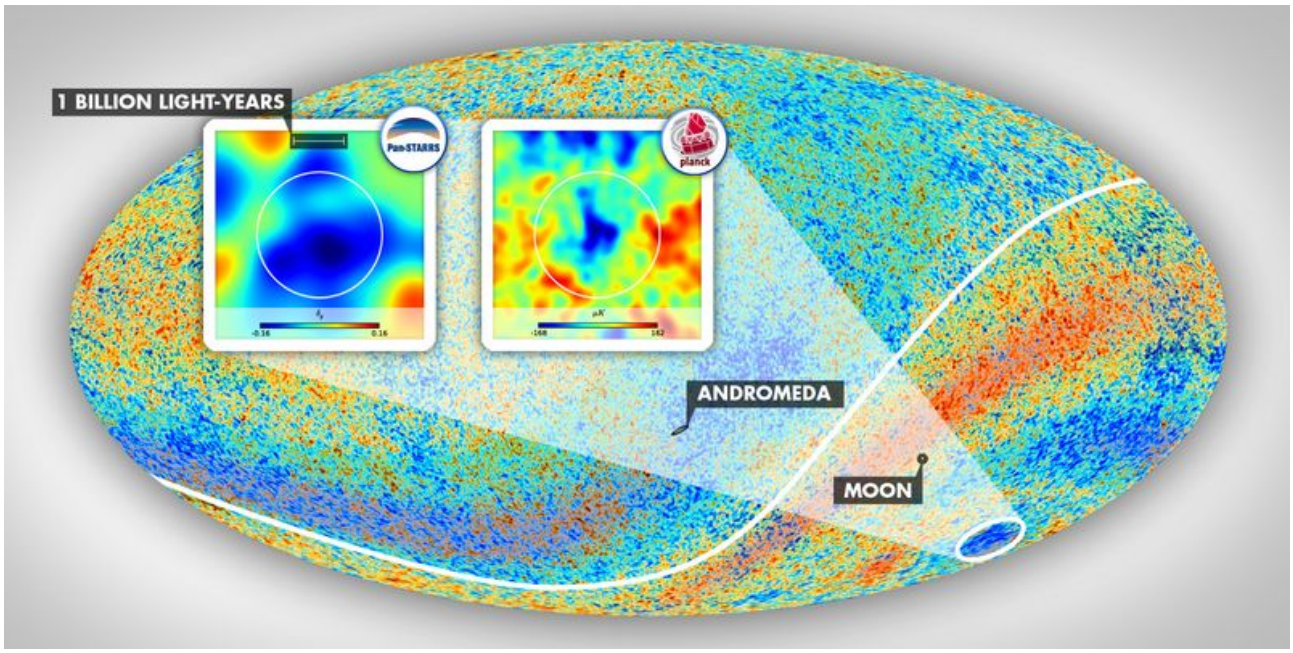


*Fig 18 - The cold spot identified on the cosmic microwave background radiation.*

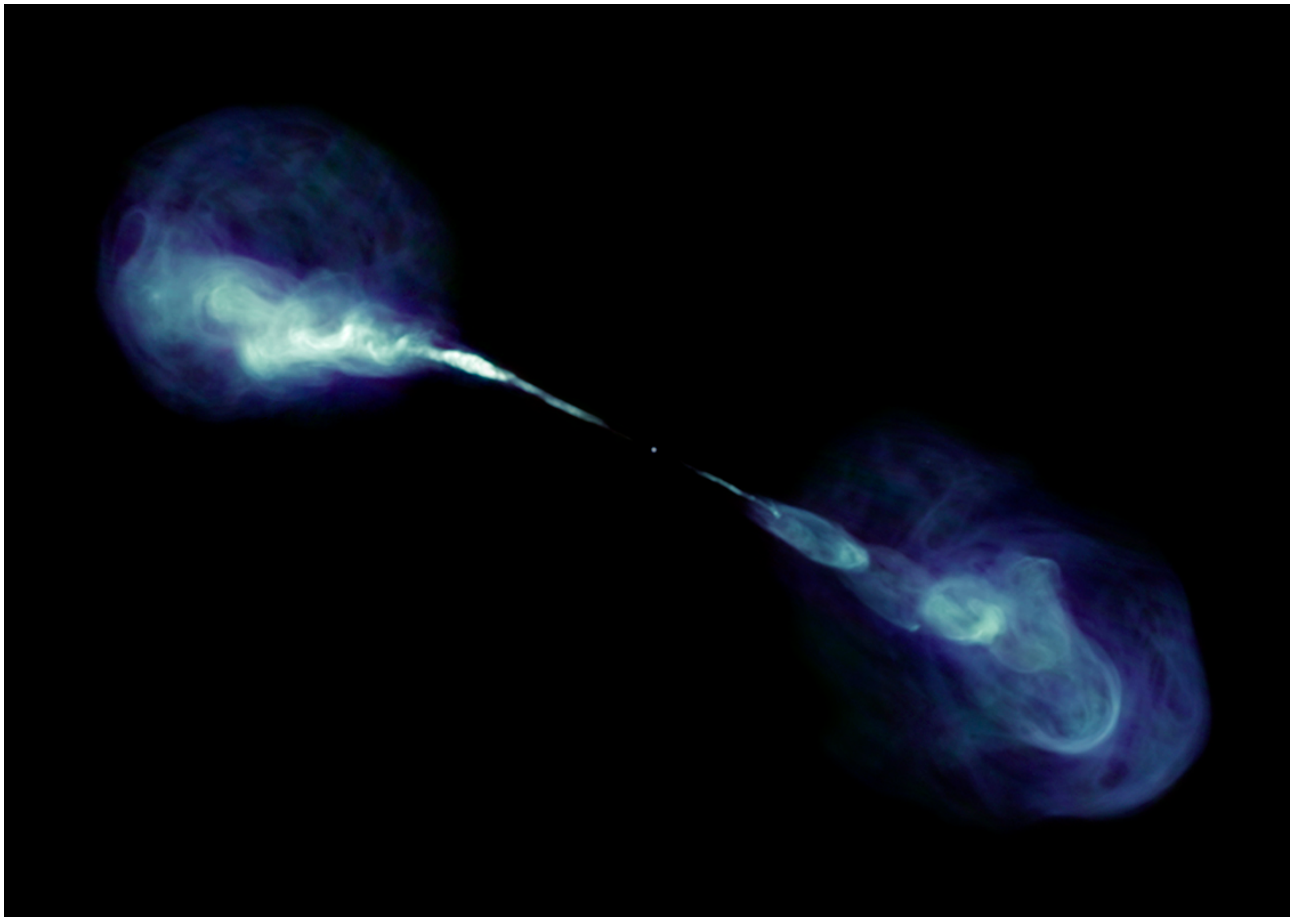

*Fig 19 : Radio of Hercules-a 3c 348 galaxy showing the relativistic jets formed by the active super massive black hole.*

the event horizon surrounding the Big Bang's singularity coupled with the idea that there is a finite amount of matter in the universe then let us now see what this cold spot actually is.

Turn the tap on, at a sink, and water comes out of the spout, turn it off and the flow of water stops. Capture the moment just after turning the tap off, causing the flow of water out of the spout to stop. In this moment at the spout the flow of water is replaced by air as the remaining water falls through the air, under the influence of gravity, and down the plug hole.

Similarly, a finite amount of matter, equivalent to the volume of water that flowed out of the tap between turning it on and off, formed the astrophysical jet that is our universe. When the finite flow of matter stopped vacuum, as opposed to air, came into the region between the Big Bang's event horizon and our new born universe. This is what I would argue is the reason for the cold spot seen on the CMB.

Looking again at an astrophysical jet coming from a black hole, Fig 19, there is the point of origin around the event horizon and the main, or mean, direction of flow. In the case of the tap the mean flow of water is down the sick hole. In the case of the astrophysical pair of jets from the black hole the main direction of flow is along the axis formed by the north and south poles of the Hercules-a 3c 348 galaxy. For our universe as a whole evidence of this can be seen from what cosmologists have coined as Dark Flow.

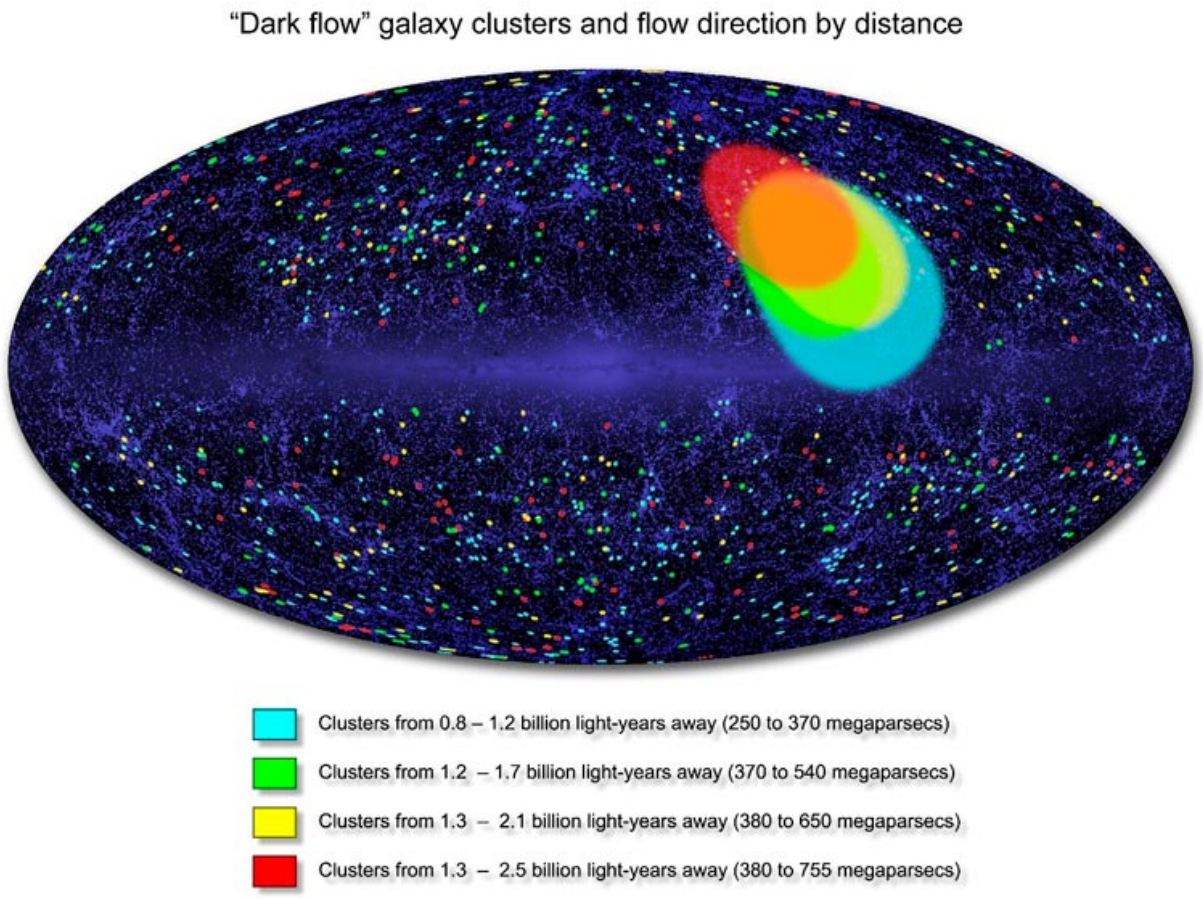


*Fig 20 - Dark Flow, as galaxies observed moving towards an unknown mass outside of our universe.*

Astronomers noticed that large clusters of galaxies in the northern hemisphere had an unusual direction of travel towards a 20-degree patch of sky between the constellations of Centaurus and Vela, as shown in Fig 20. The suggested reason for this was that these galaxy clusters were being attracted to something outside our observable universe.

I would argue that the mean direction of flow of our universe's astrophysical jet is the exact reason why we see this unusual direction of travel within these galaxy clusters. Firstly, the cold spot of the CMB is in the southern hemisphere and oppositely the Dark Flow phenomena as seen in the northern hemisphere. Secondly, data from the Planck space telescope showed no evidence of dark flow on that sort of scale, discounting the claims of evidence for either gravitational effects reaching from beyond the visible universe.

# The Brout-Englert-Higgs Mechanism

The unification of the weak and electromagnetic forces, into the electroweak force, within the theoretical framework of the Standard Model led to the description of the electroweak force and its associated force-carrying particles. However, the theory had the W and Z bosons having no mass whereas they actually have a mass 100 times that of a proton. This was resolved in the 1970s when theorists Robert Brout, Francios Englert and Peter Higgs introduced a mechanism where the W and Z bosons interact with an invisible field, now called the Higgs Field, which pervades the entire universe. Since then the confirmation of the existence of the Higgs particle has shown this to be true.

In essence, the breaking of symmetry triggers the Higgs mechanism, causing the bosons it interacts with to have mass. In the Standard Model, the phase Higgs mechanism refers specifically to the generation of masses for the W and Z weak gauge bosons through electroweak symmetry breaking.

Just after the big bang, the Higgs field was zero, but as the universe cooled and the temperature fell below a critical value, the field grew spontaneously so that any particle interacting with it acquired mass. The more a particle interacts with this field, the heavier it is. Particles like the photon that do not interact with it are left with no mass at all.

With this all said about the Higgs mechanism let us look at how it fits into my description that our universe of ordinary matter, in the moments after the Big Bang, divided from a single body of

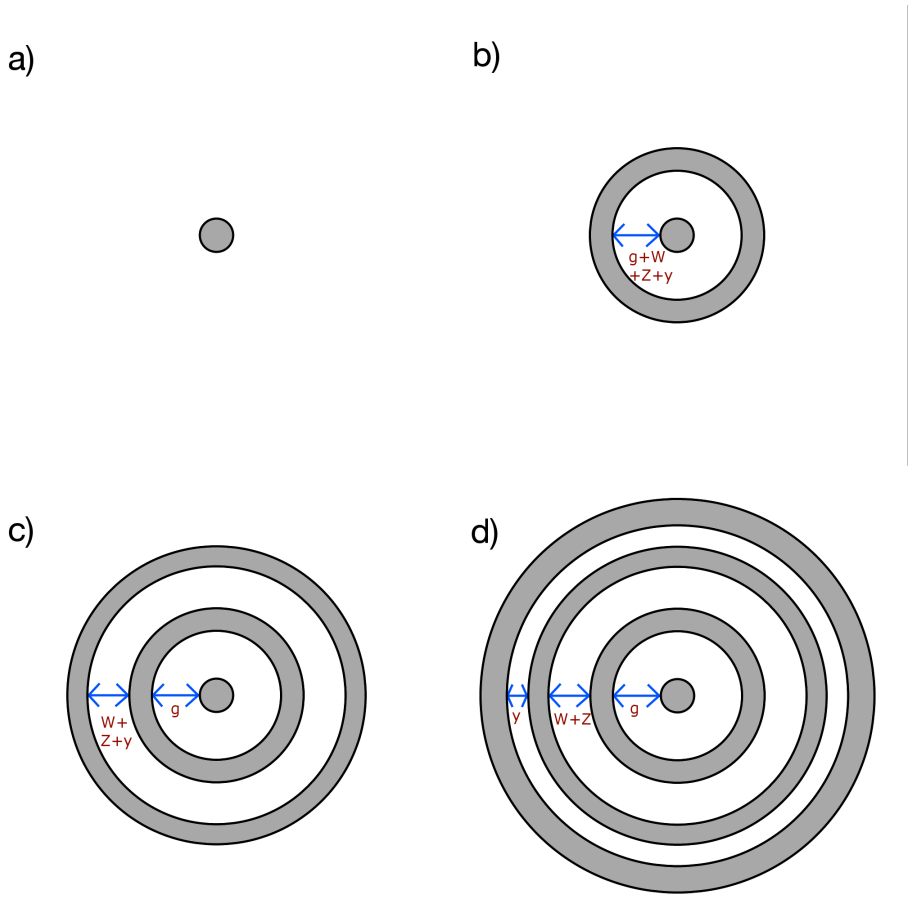


*Fig 21 - Cross-sectional views of the relativistic jet at different stages in its formation. a) At $10^{-43}$s the jet is a single body of matter. b) At $10^{-35}$s the jet breaks into two bodies of matter and force comes into existence and the outer edge of our universe is defined. c) The inner body of matter divides giving rise to the strong nuclear force. d) The middle body of matter divides with the inner layer forming quarks and outer layer forming leptons.*

matter into four concentric rings of matter each separated by a body of vacuum across which force acts and is given form.

Firstly, the Higgs field is zero just after the Big Bang when it is a single body of matter. The Higgs field is only seen to turn on when the temperature falls below a critical value and when it does symmetry breaking, or bifurcation, of the electro-weak force comes into effect, as depicted in Fig 21(c)-(d). Importantly, it is only by Fig 21(c), when the central body of matter has divided to form the quark ring is the central body able to function as the Higgs Field and effectively switch on.

Secondly, the Higgs field is described as a field that pervades the entire universe where as its particle, the Higgs boson, has no spin and thus is classified as a scalar boson. This property of the Higgs boson having no spin lent insight in describing what the three concentric bodies of matter actually are. Namely, the most central body of matter, that is the very heart of the relativistic jet is the actual Higgs field. Because it is in the centre of everything in our universe it is thus all pervasive, as an invisible field.

The central most body of matter is the Higgs Field, once bifurcation of the quark body has happened and the strong nuclear force comes into existence, Fig 21(c). It is at this point that the mechanism by which the Higgs Field operates comes into existence. This in turn leads to the next bifurcation event where upon the electroweak force divides.

With the Higgs particle taking centre position the idea for how the other particles fit into this picture comes into place. Namely, the first ring of matter out from the centre is the matter from which quarks are formed. In turn, leptons are given form by the second ring of matter.

Across each of the vacuum spaces between the rings of matter force is given effect. The type of force and thus its associated gauge boson is determined by which vacuum the force is acting across. That is, the force in the first vacuum space between the Higgs and the quark body of matter is the strong nuclear force as carried by the gluon. Next the weak nuclear force is given form in the second vacuum space whilst the electro-magnetic force forms in the outer vacuum body.

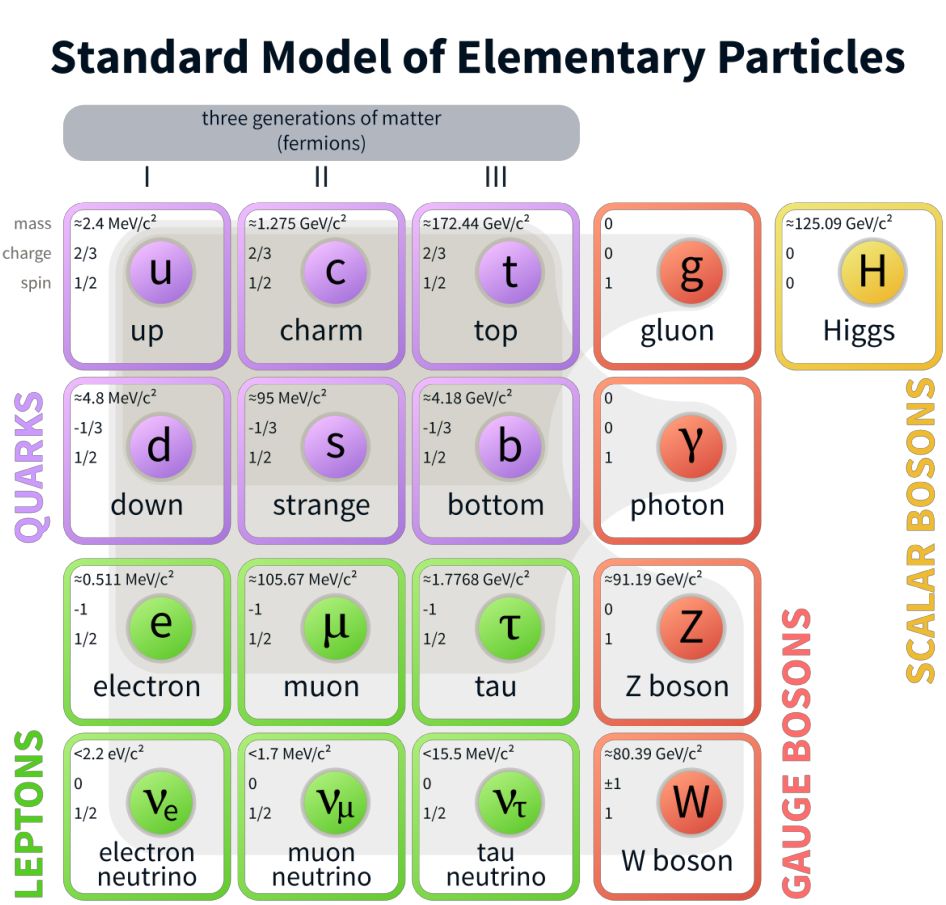


*Fig 22 - The Standard Model of Particle Physics showing the elementary particles of nature from which our universe is formed.*

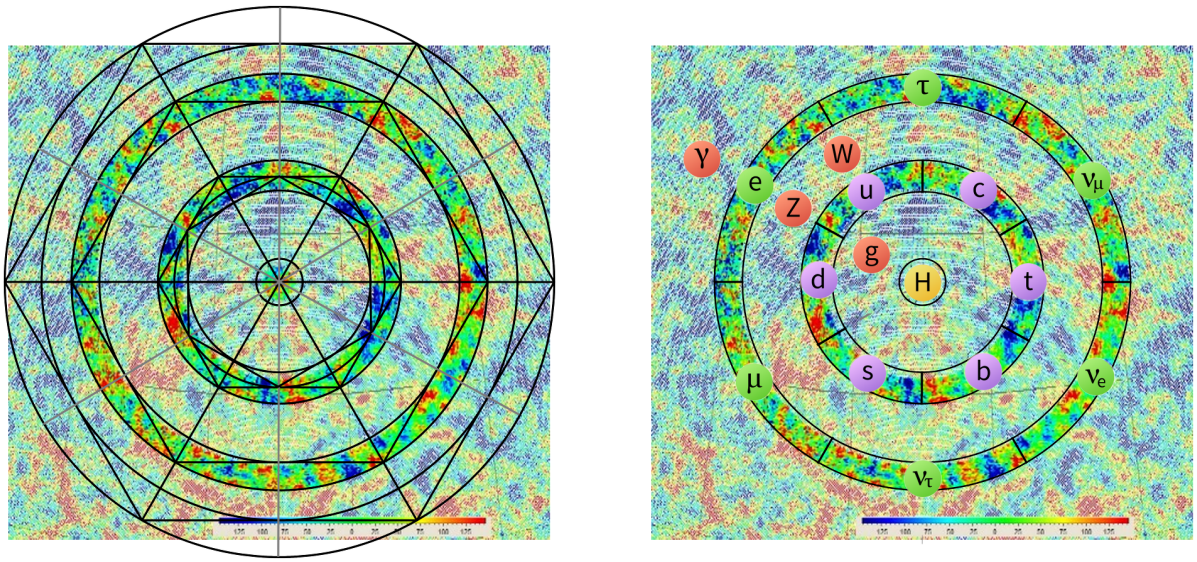


*Fig 23 - Mapping the Standard Model onto the three concentric circles of the CMB. The left image shows the structural interpretation lines I used in determining how a 6 sided hexagon, contained within the circular boundaries of the respective circular bodies of matter. The image on the right shows the elementary particles and their possible respective positions within their corresponding bodies of matter or vacuum with respect to gauge bosons. The outer circle of leptons is simple in that one hexagon fits between the circular boundaries. For quarks both an inner and outer hexagon fit into the respective region on the CMB whose effect is to bind quarks into triplets forming particles such as the proton and neutron, as well as giving rise to the Z and W gauge bosons of the weak nuclear force. It is important to note that my positioning of the specific particles is a best guess effort with their respective positions considered by how we observe or rather don't observe them, as is the case for neutrinos. The position of our place in all of reality is on the outer circle between the photon and electron.*

## Six Leptons and Six Quarks

Matter, as we know it, is composed of 12 fundamental particles or fermions that are in turn divided into two groups: the leptons and the quarks. In total, there are 6 quarks: up, down, charm, strange, top and bottom. Again, there are 6 leptons: electron, muon, tau, electron-neutrino, muon-neutrino and tau-neutrino. Fig 22 shows the arrangement of particles as defined by The Standard Model.

A proton is composed of two up quarks and one down quark. Vice versa, a neutron is made of one up quark and two down quarks. A particle whose components are made from other types of quarks is not something we encounter in our daily lives. In fact, such matter is usually given the term exotic.

An electron is an electron to us and does not decay. On the other-hand, the tau and muon are unstable to us and decay. The family of neutrinos is almost invisible to us.

With this said, the idea of how The Standard Model fits together when viewed as a series of 3 concentric bodies of matter, separated by vacuum is shown in Fig 23.

Thus, if so, when all this is put together we can describe the Big Bang as the formation of our relativistic jet of ordinary matter, in conjunction with our anti-twin, that quickly divided from a single body of matter into a series of four concentric ring shaped bodies of matter, each separated by a body of vacuum. Because there are 6 leptons and 6 quarks the idea of viewing the relativistic jet as being hexagonal rather than circular in structure came into being.

## Saturn's Cross-section of our Universe

Nothing but nothing puts this idea, that I have just described for you here for the first time, as seeing a similar storm system. Pictures of nature speak as loudly to evidence in science as do simple diagrams, like Fig 23. Namely, the hexagonally shaped vortex, as photographed by Cassini, at Saturn's North Pole demonstrates the fluid dynamics that gave rise to the universe of galaxies that we see before us today.

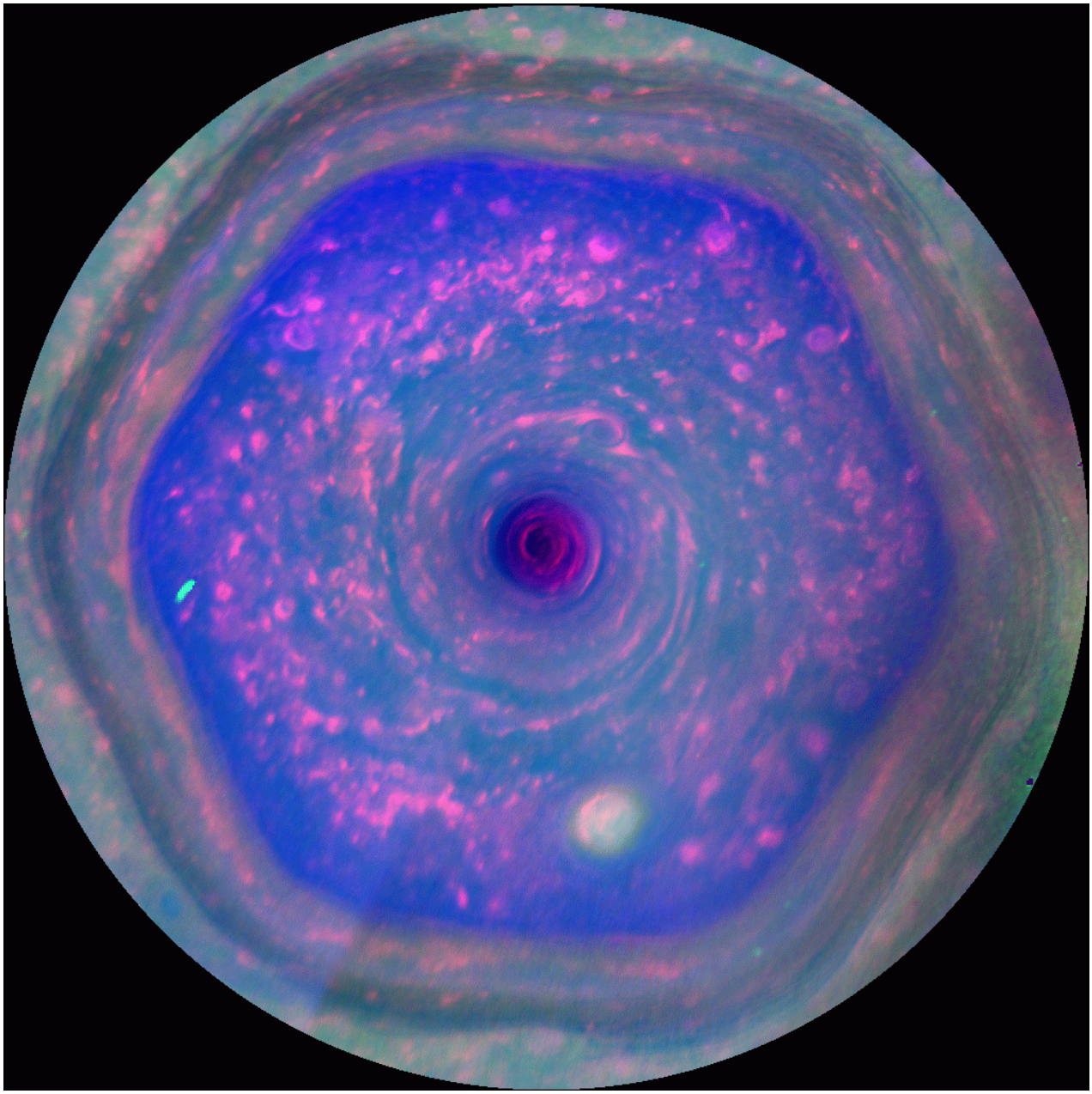

*Fig 24 - The North Pole of Saturn with its hexagonal storm system as captured by the Cassini spacecraft.*

In Fig 24 and 25, we see the hexagonal storm system that covers the North Pole of Saturn. Note the concentric layers of irrotational and rotation flow particularly towards the centre. To be honest, in trying to find the worlds to describe the physics of my idea as to how it relates I am left with nothing to say. The pictures of Fig 24 and 25 I think say it all, particularly, with all those disc shaped clouds that look very much like galaxies to my eye.

Well, there was is one thing that says it even more loudly, as shown in Fig 26. Namely, the thermal image showing the temperature differences within the storm system. Here you can see three very

distinct circular regions inside the outer hexagonal boundary. Also remember the Cosmic Background Radiation is in fact a thermal image in the exact same manner as the picture of Saturn is one as well.

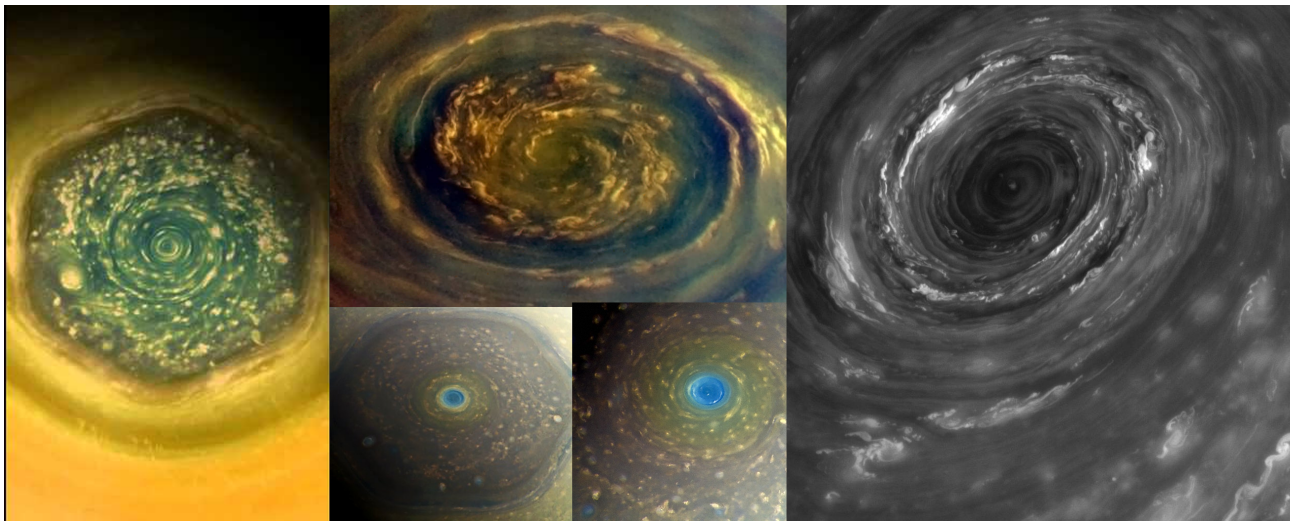

*Fig 25 - Composite of various pictures of Saturn's hexagonal storm located at its North Pole. Both the whole of the storm system is shown and close ups of its centre showing the various layers of irrotational flow.*

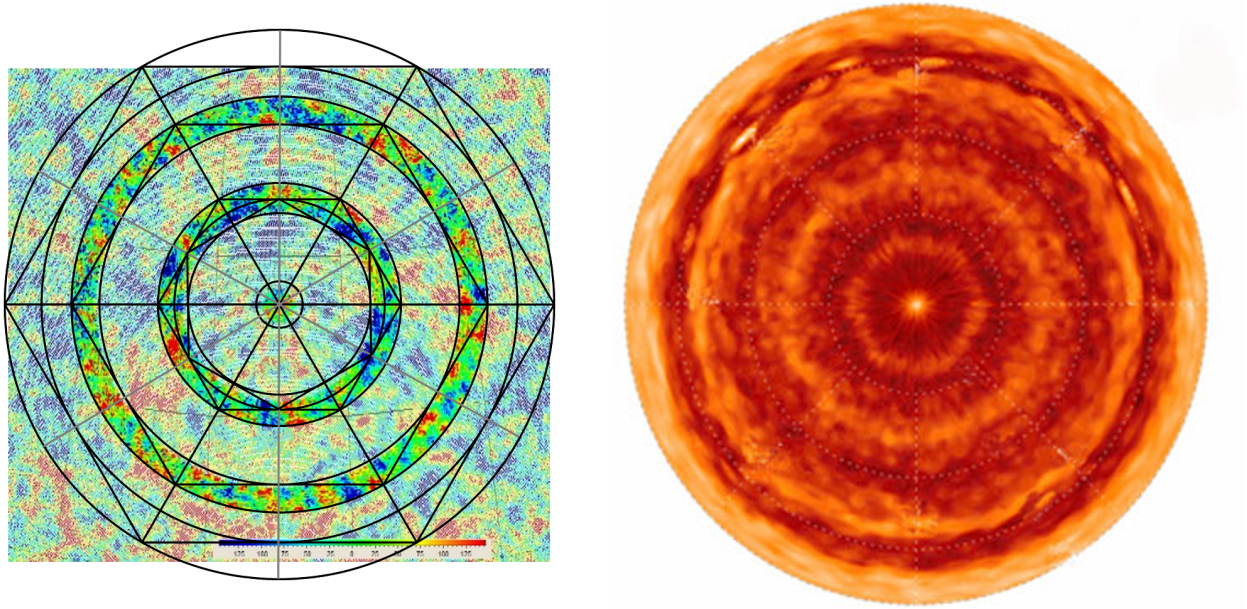

*Fig 26 - The image on the left hand side is of the three concentric circles as discovered on the Cosmic Background Radiation with the lines of bifurcation and unification shown. The image on the right hand side is a thermal image, taken by the Cassini's infrared spectrometer, showing the temperature difference (72-84Kelvin) within the storm at Saturn's North Pole.*

## Fractal Geometry

A fractal is an abstract object, used to describe and simulate objects in nature, which continually exhibit the patterns seen within it at increasingly small scales. Known as expanding or evolving symmetry we can see this effect in nature, or rather is nature. That is, the pattern depicted in Fig 26 is seen at every scale and such is the case that we see this pattern in all its beautiful structure in our very solar system at the North Pole of Saturn.

I say, is nature, on purpose as if we again go back to my description of the light cone as being the point of bifurcation then from the start we introduce the kernel that gives rise to the fractal pattern and ultimately chaos in nature.

## Cross-Sectional Analysis of the Rings

Looking again at the structural interpretation of the concentric rings we now look at constructing a cross-sectional interpretation through the centre of these rings.

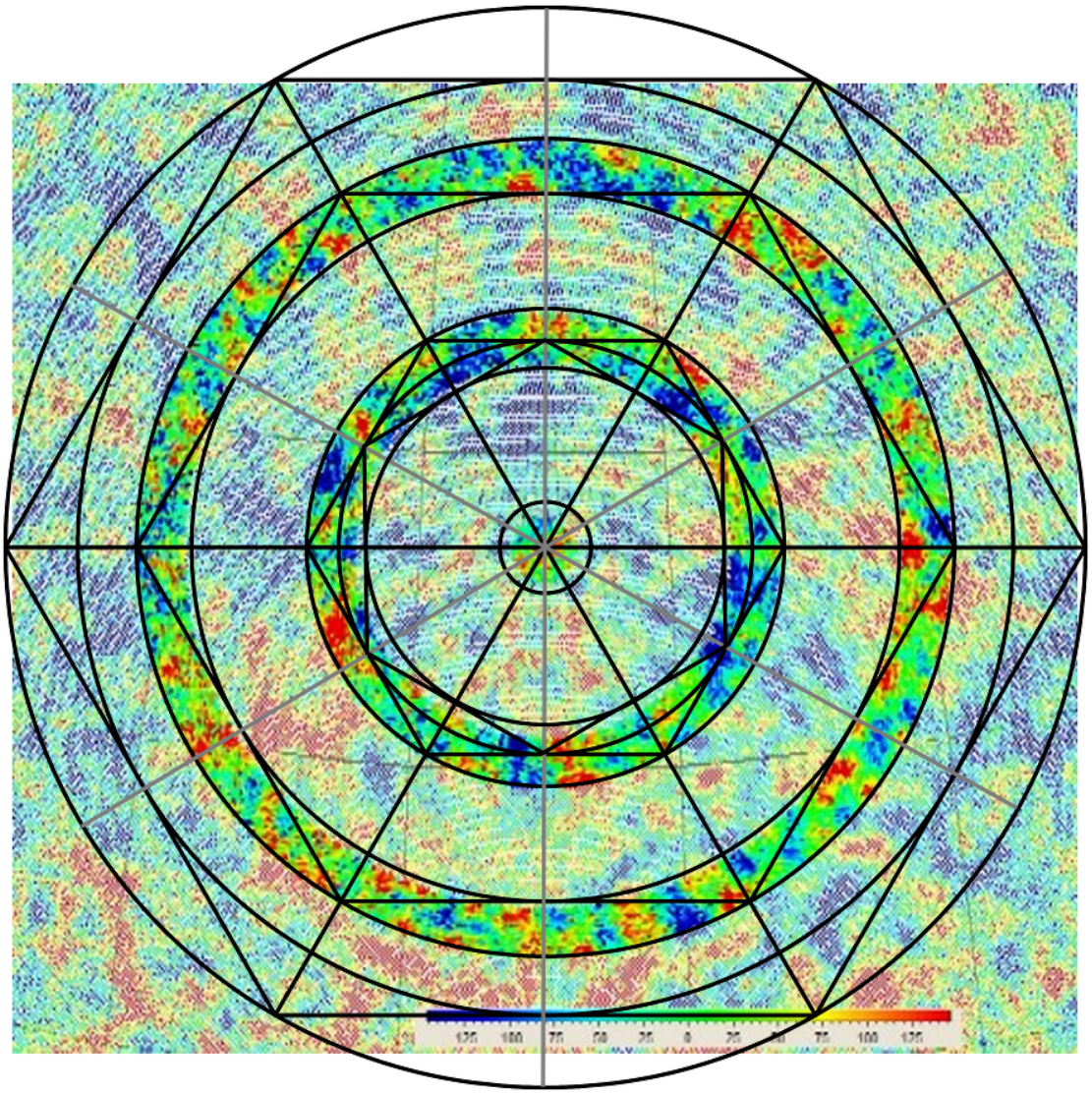

*Fig 27 - My structural interpretation of the concentric rings as seen on the cosmic background radiation.*

Taking one of the grey or black lines which crosses over all the rings, intersecting with the centre, we define a plane through this line that is perpendicular to the plane of the image showing the rings. It is onto this plane that I extend my structural interpretation of the concentric ring formation.

The cross-section, shown in Fig 28, slices through both our jet and the jet of belonging to our twin universe of anti-matter.

Starting in the centre of the image there is a blank circle that represents the event horizon of the Big Bang singularity. The central premise upon which I base my argument is that we should view

the behaviour and mechanics of the Big Bang event in the same light as how a black hole behaves. A black hole has a defined spherical event horizon. So in turn, I start my interpretation by placing the circular region of this event horizon in the very centre. I deliberately leave it blank because for the exact same reason, namely the no-hair theorem, we cannot see inside this event horizon.

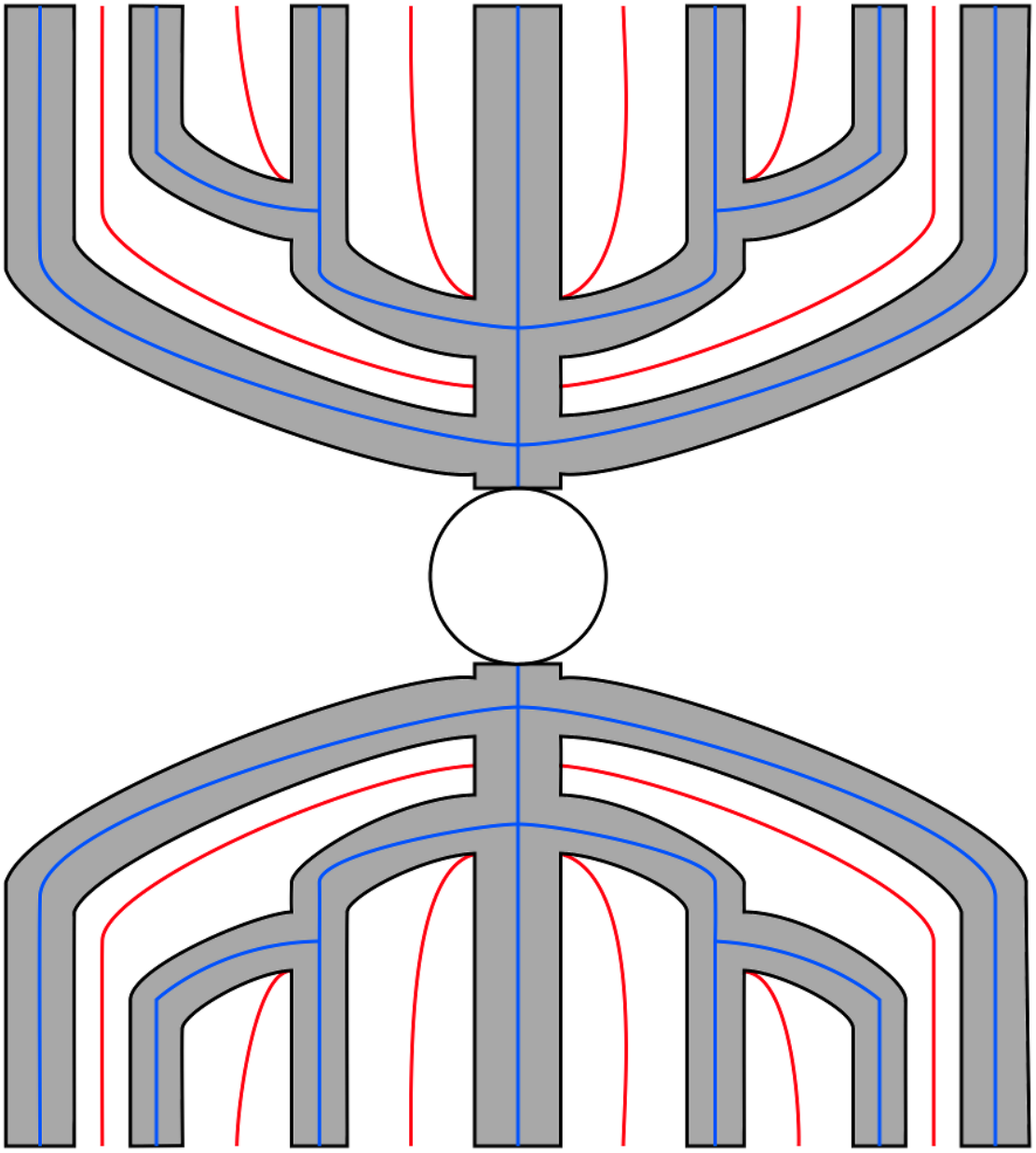

*Fig 28 - Cross-sectional structural interpretation showing the bifurcation of the two astrophysical **universal jets**. One jet forms our universe of ordinary matter and the polar opposite the verse of antimatter. The grey shaded area is matter separated by the white vacuum. The holo sphere in the middle is the event horizon of the Big Bang singularity. The red lines denotes areas where the arrow of time runs from the past into the future, or away from the singularity event horizon. The blue lines denote areas where the arrow of time runs from the future back to the past, or towards the singularity event horizon.*

For simplicity I do not show any input, for example via an accretion disc. Strictly, at this moment in time we limit the scope of our discussion to the output of the singularity. Another reason for

looking at the output only is because any discussion concerning the shape of the input is as speculative as the structure of cold dark matter, for that is what it is to me.

In The Bifurcation of Force section, previously, we saw how from a solid volume of matter through bifurcation divided into a series of four concentric rings of matter. Reproduced in Fig 29, we show this separation in tandem with seeing how from a single unified force the fundamental forces of nature came into being.

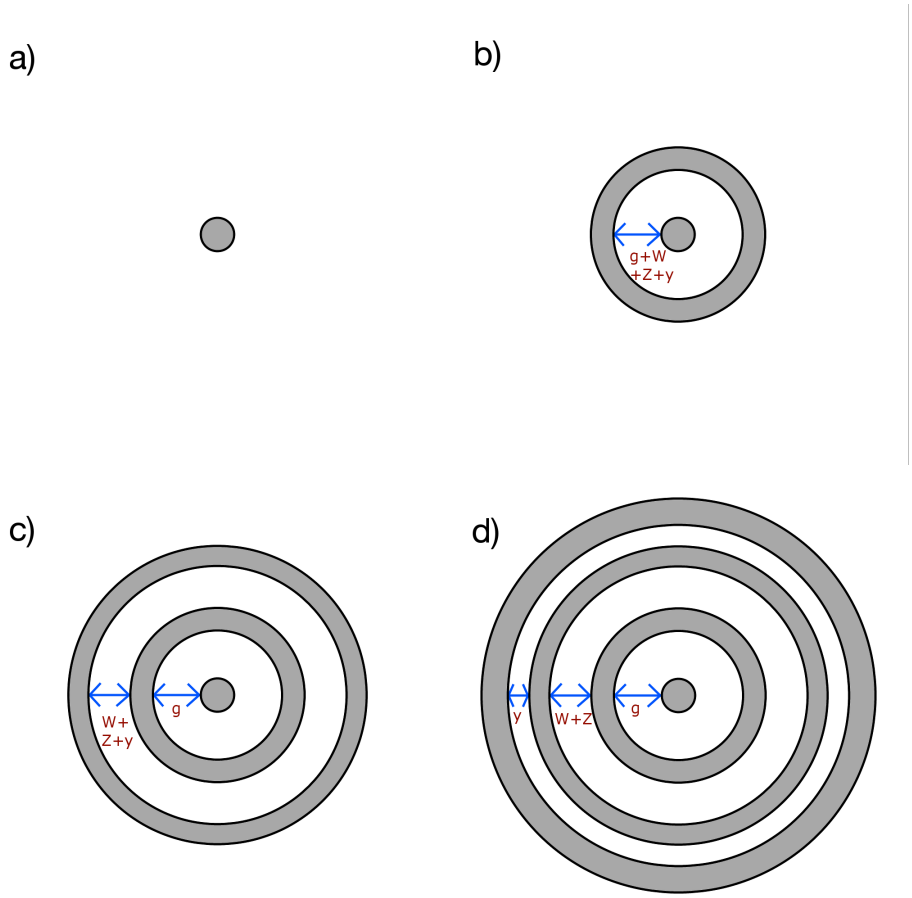


*Fig 29 - Cross-sectional views of the relativistic jet at different stages in its formation. a) At $10^{-43}$s the jet is a single body of matter. b) At $10^{-35}$s the jet breaks into two bodies of matter and force comes into existence and the outer edge of our universe is defined. c) The inner body of matter divides giving rise to the strong nuclear force. d) The middle body of matter divides with the inner layer forming quarks and outer layer forming leptons.*

As a reflection of this process we divide the single column of matter, moving away from the central event horizon, with the same sequence of divisions. So in the first division the outer bounds of our universe are defined. As this forms the envelope in which our universe is contained we do not see this on the microwave background radiation.

With the second division in the now central volume of matter the unified force breaks giving the strong nuclear and electro-weak forces. Finally, the division in the now middle ring of matter breaks to give us both the electromagnetic and weak nuclear forces along with the final structure consisting of four concentric rings of matter separated by vacuum.

In light of my description whereby someone falling into a black hole will travel backwards in time to the very beginning I have drawn in lines representing this idea. That idea being that in a vacuum time, as we observe it, runs forwards, as depicted by the red lines. Vice-versa, in a solid volume of matter such as a black hole time runs backwards, relative to our experience, as depicted by the

blue lines. Although the actuality of temporal mechanics is far more complicated than this, as we shall see when I come to discuss Slow Light, it serves as an overall guide in picturing temporal flow.

## Communication of The Idea

The primary purpose herein, is to present my idea to you in conjunction with peer-reviewed evidence, as it stands, in order to convince you of its validity. In trying to nullify my own idea I have found myself digging into every corner of physics from cosmology through to quantum mechanics. Without shoehorning, this idea has come back stronger and stronger each time as my mind clicked another piece of the jigsaw into place.

Each time I have dug down in order to understand the science behind the evidence I find myself met with fields of knowledge; each field a lifetime's dedication on its own. In my life, that dedication ended up being mainly to the fields of information theory and fluid mechanics.

In writing this I wish to communicate my idea to two audiences. Firstly and foremost, to physicists. Unfortunately, an assumption of presumed knowledge or I leave something unsaid because to my eye it is obvious. To this end, I am looking to constantly improve reasoning, thinking and explanations, while in turn linking to other articles that explain the background. Also I wish to note that this is an ever evolving idea, primarily evidence driven.

My second audience I want to communicate this to is a more general and wider audience. To my mind it is simple and beautiful. However this beauty can somewhat become conflated being embedded in the context of the current scientific evidence and debate. But I think it is both wonderfully beautiful and so elegantly simple that just by the pictures alone it can be communicated.

As beautiful as the universe is, my vision extends beyond merely looking up. My vision extends to travelling to the distant stars.

The engineer in me looks at this with only one primary invention in mind. A craft capable of instantaneous or near instantaneous interstellar space travel. Ironically, I look at the state of technology and research today and wonder, "Does anyone else realise that we are bearing down on the abilities and means of travelling across the expanses of space without even knowing it?"

Skeptical, I don't blame you? Well let me try and convince you, otherwise, in the context of what I have presented so far.

My idea started by picturing the Big Bang not as a massive spherical explosion, isotropic and homogenous going in every direction. Rather I pictured it as a relativistic jet, one of a pair, with a defined direction as it expanded into the temporal vacuum of the void. That direction, rather than being spacial, is in fact a temporal direction. That is, it explicitly defines the arrow of time.

In previous sections, I have tried to show that this is indeed the case by:

- Showing that ordinary matter and anti-matter are in fact the same thing, namely matter, but with opposite temporal directions, as well as rotation.
- In examining the improbable alignment of both the solar and galactic ecliptics with respect to features from the microwave background radiation we see evidence of the jet's direction.
- I defined the idea of a temporal horizon in tandem with seeing how the horizon to our observable universe acts as galaxies we observe today accelerate over and beyond that horizon.
- Extending the idea of a temporal horizon we see how the event horizon of a Black Hole is a self-contained spherical temporal horizon. In addition, I provide a greatly simplified argument that works towards answering the infamous Hawking Paradox. This in turn, helps give a cleaner definition to exactly what I mean by bifurcation.
- By picturing the structure of the universe, through the lens of a grand unified theory, I presented a concentric ringed hexagonal structure, whose dynamics are mirrored by the vortex at Saturn's north pole, in hand with the Standard Model.

In the next section, we will look at tying all the various anomalies from the microwave background radiation up into a single complete picture.

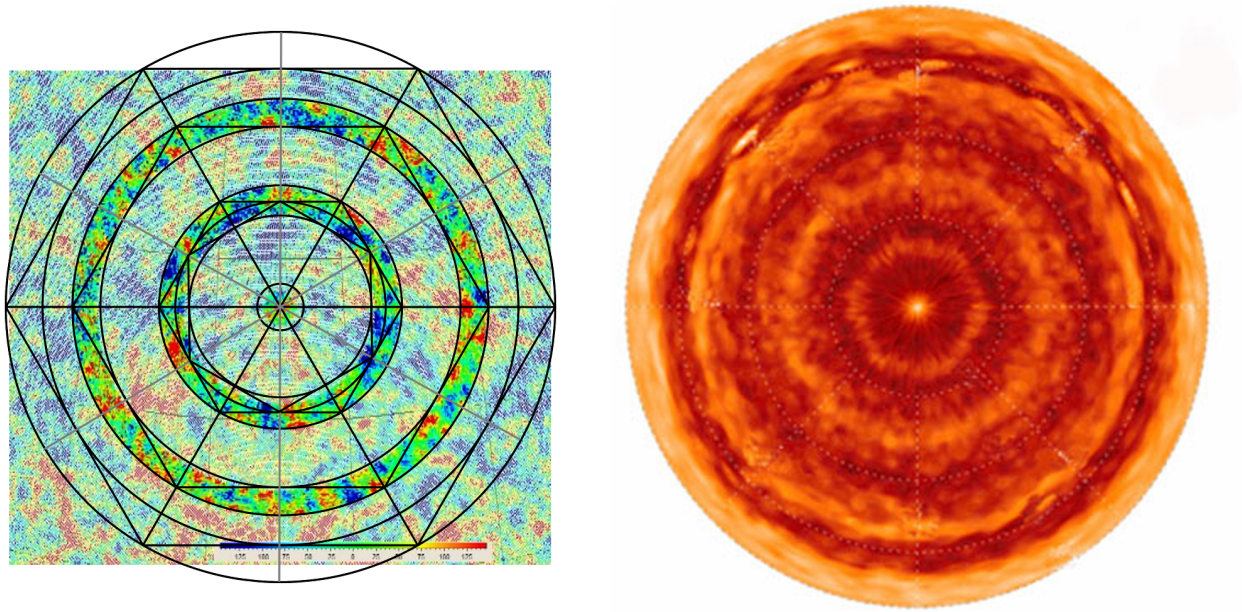

*Fig 30 - The image on the left hand side is of the three concentric circles as discovered on the Cosmic Background Radiation with the lines of bifurcation and unification shown. The image on the right hand side is a thermal image, taken by the Cassini's infrared spectrometer, showing the temperature difference (72-84Kelvin) within the storm at Saturn's North Pole.*

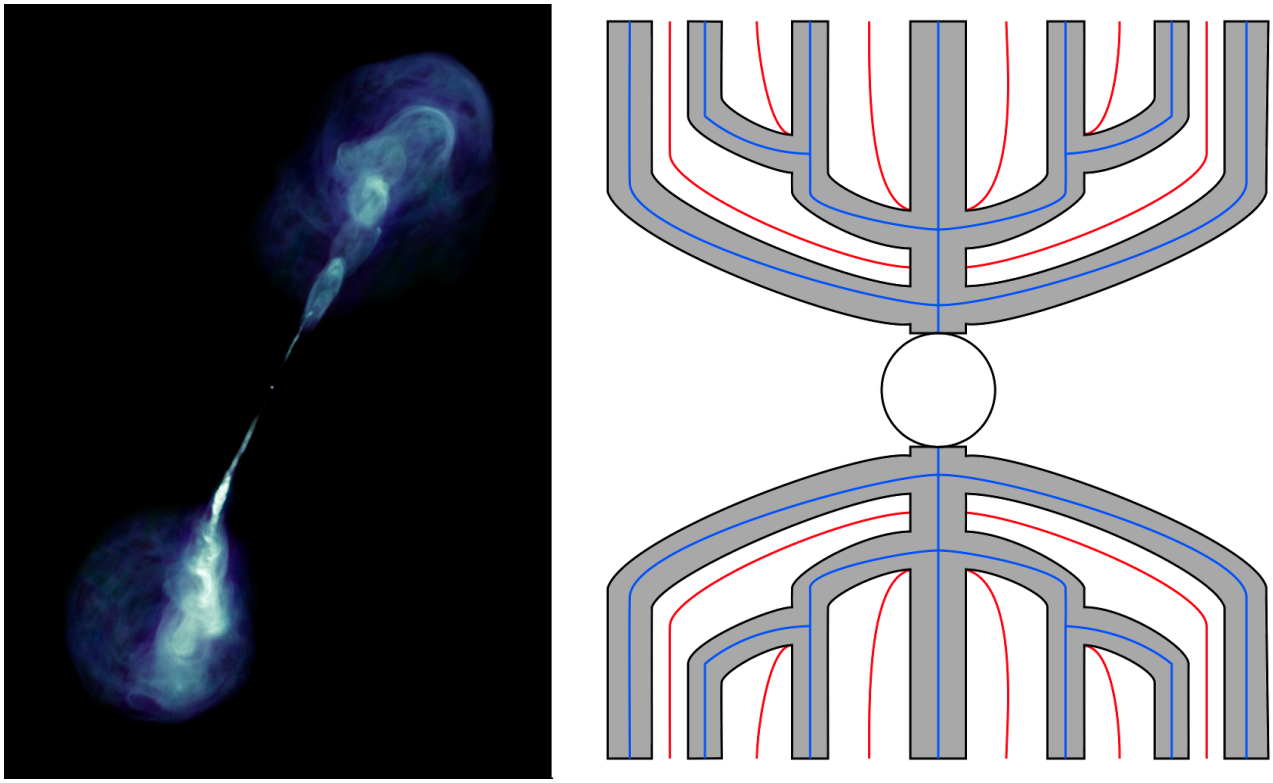

*Fig 31 - The astrophysical jets of Hercules-a 3c 348 galaxy on the left. The right image shows the structural interpretation through these jets.*

With all this said, it is not too hard to imagine the structure of our universe, mainly because nature has given us all the pictures that we need in order to imagine it. The two key pictures of nature I would choice, for the moment, are shown in Fig 30 and 31.

The first shows the concentric rings with my current structural interpretation. Coupled to this is a thermal map of Saturn's hexagonal storm at its north pole, as captured by the recently deceased Cassini probe.

The second is a cross-section through these rings in order to describe their structure and bifurcational process. The red lines show forward flow of time, blue the reverse flow. This is coupled with the radio telescope picture taken of the active Hercules galaxy showing a pair of these relativistic jets.

To quote Sir Roger Penrose, who with Stephen Hawking helped show that the universe was born from a gravitational singularity: "Consciousness is part of our universe, so any physical theory which makes no proper place for it falls fundamentally short of providing a genuine description of the world".

Although the focus in all of this is strictly evidence based, I wish to impart a tale, that puts this quote into prospectus.

Only I know what was truly on my mind when I came up with this idea and you'd probably never guess correctly in a million years. But in the context of an evidence based discussion it has no place. But the tale to be told here is in the composition of my cross-sectional diagram.

I initially drew this picture in early August 2017 as a cross-section based upon my arguments in order to visualise and communicate it. A week after I went on holiday to Hong Kong with the question "What character in the Chinese language matches this symbol?". This was primarily motivated by the infamous scene, depicted on the Arch of Titus, showing the looting of Jewish Temple in Jerusalem by the Romans.  The shape of the seven pointed candle stick in comparison to the jet section I had rendered is very similar. A coincidence? Well, maybe.

*Fig 32 - The Romans looting the Jewish Temple of Jerusalem, AD 70, as depicted on the Arch of Titus. The seven pointed candlestick holder called The Menorah and used in Hanukkah.*

The probability, to my eyes at least, of such a coincidence was given clear focus while in Hong Kong upon visiting the Tian Tan Buddha site. Between the symbolism of concentric rings and lotus flowers and the two pictures I use to communicate this idea the only thing I can say in truth is, “But off course! We’ve known, we’ve always known. In some form or another every human being that has ever lived, at the seat of their soul, they have always known what the truth is.”. Its just taken till now to fit it all together. Well, on this I can only speak for myself.

To be perfectly honest, on one level I’m deeply disturbed. Or rather the rationalist in me is fighting like mad, driving the need for nullification, because what is now a days is considered irrational is completely rational to my eyes. But deep down my subconscious says, “But off course.”

For many reasons, this is all I will say here in regards to my idea and our most sacred beliefs. Primarily because natural explanation, in the full context of my idea, to what science currently considers to be the super-natural maybe a bit of turn off and extremely controversial. Secondly, the primary application of interstellar space travel in this the evidence is held in utter contempt by the scientific establishment.

The one truth I can see is that there is an extremely fine line between what can be proved and what cannot be proved. “God plays with dice, but they are loaded in his favour”, as in all things there is science and then there is faith. Both go hand in hand together in my view.

Before departing this arena I have one question really. By extension of fractal geometry and logic, that sphere in the middle of creation between the two jets should internally be a complete mirror image of both verses. Like particles that fall into a black hole, dividing such that what we see in our observable universe as Hawking radiation by extension could be said for the whole of our universe in relation to that sphere. Off course, there is no scientific evidence for this existence spherical region.

With this in mind, what do you think a good name for that sphere is?

## Hyperbolic, Parabolic and Ecliptic PDEs

Before continuing we quickly look at the classification process for partial differential equations in what exactly is meant when describing a behaviour as being elliptic, parabolic or hyperbolic.

In the most general case, when the behaviour of the system or device is sought as a function of both time and space, the governing equations are Partial Differential Equations (PDEs). Classification begins by considering a PDE of the following general form:

$$A\frac{\partial^2 \mathrm{u}}{\partial \mathrm{x}^2} + B\frac{\partial^2 \mathrm{u}}{\partial \mathrm{x}\,\partial \mathrm{y}} + C\frac{\partial^2 \mathrm{u}}{\partial \mathrm{y}^2} + D\frac{\partial \mathrm{u}}{\partial \mathrm{x}} + E\frac{\partial \mathrm{u}}{\partial \mathrm{y}} + Fu = 0$$

where x and y are so-called independent variables while u is the dependent variable. The coefficients A, B and C are either constant or functions of the independent or dependent variables. If any of the three coefficients is a function of the dependent variable u, the PDE becomes nonlinear. Otherwise, it is linear. Depending on the values of the coefficients A, B and C, PDEs are classified as follows:

- If $B^2 - 4AC < 0$, then the PDE is elliptic.
- If $B^2 - 4AC = 0$, then the PDE is parabolic.
- If $B^2 - 4AC > 0$, then the PDE is hyperbolic.

For a first-order PDE, the method of characteristics discovers curves, called characteristic curves along which the PDE becomes an ordinary differential equation (ODE).

# A New Interpretation

In trying to present this new interpretation of reality it is important to keep in mind that this is effectively the first draft in trying to present the wider context of my idea.

There are two sides to my theory, as does a ring have two sides, an inner and outer. The first is the process of bifurcation where in a volume of matter separates into two bodies separated by vacuum. The second is the process of unification, but better known as wave function collapse. Bifurcation happens on the inside, while unification occurs on the outside of the ring of matter. My reasoning, I will present when we finally come to look at the Double-Slit Experiment and the Measurement Problem. For now, I wish only to concentrate on providing a radically different view of particle physics.

That is, so far, I have looked to paint a picture of how our universe is in fact a relativistic jet emerging from a singularity, or rather from around its event horizon, whose hexagonal structure gives rise to the six fundamental leptons and quarks. The important detail in understanding this new interpretation of particle physics comes about from the layers of rotational and irrotational flow.

The interpretation comes in respect understanding that it is we, all of reality that we see and observe, is the result of constant rotational motion at the speed of light, with respect to the void surrounding our universe. It is the key, to understanding why we experience a world whose spatial dimensions appear to us as straight. Namely, the why of Euclidean geometry, is its underlying mechanism.

In order to see this we first look at the steady Euler equations for irrotational flow of the form:

$$\left(1-M^2\right)\frac{\delta^2\varnothing}{\partial s^2}+\frac{\delta^2\varnothing}{\delta n^2}=0, where\ M=\frac{u^2}{c_s^2}$$

Where M is the Mach number with *c* equal to the speed of sound, *s* is the coordinate along a stream line and *n* is the coordinate perpendicular to a stream line. Evaluating the determinant $B^2-4AC$ shows that the equation is hyperbolic for supersonic (M>1) flow, parabolic if the flow speed is exactly the speed of sound, and elliptic for sub-sonic flow. One also concludes that the problem is always elliptic if the flow is incompressible because in that case the speed of sound is infinite such that M=0 always.

So, that is the mathematics for irrotational flow with respect to a jet going supersonic. The vapour cone that can suddenly form on a supersonic jet shows exactly this behaviour, as shown in Fig 33.

The vapour cone is a cone with straight, parabolic edges!

Rather than the vapour cone forming at the speed of sound, image a volume of matter travelling at the speed of light. A photon, from this point of view is a stationary packet of matter whose dimensions is equal to its frequency. The volume of matter collides with the stationary photon at the speed of light. But rather than a vapour cone, maybe if you will, a light cone forms whose edges are straight.

This leads back to my original statement being that the light cone, of the Lorentz Transformation, is bifurcation point between hyperbolic and elliptic 4D spacetime geometries whose crossing point forms the parabolic geometry we experience in our everyday lives.

*Fig 33 - F18-Hornet travelling supersonic around which a vapour cone has formed. The air surrounding the jet crosses over from hyperbolic, or supersonic, irrotational flow to subsonic and thus elliptic irrotational flow. The parabolic straight line is seen in the vapour cone.*

## Tying up the CMB Anomalies

In this section, I want to bring together all the various anomalies and features that appear in the Cosmic Microwave Background radiation and describe them in the context of the idea that our universe is a rotational jet of matter.

To be honest, like many others, I am fairly skeptical concerning the data and its interpretation in regards to the Cosmic Microwave Background radiation. Off particular note is the infamously labelled Axis of Evil.

In essence, the data shows a clear temperature difference between the two hemispheres with the axis whose plane coincidently aligns with our solar system. That is, the plane on which the Earth and all the other planets in our solar system rotate around our Sun lie on the same plane. Dr. Dragan Huterer has a very good presentation describing the science and analysis of the CMB data.

The problem for physics is that in a homogenous and isotropic universe, as described by Einstein's theory of relativity, there should be no preferred direction or orientation. Much argument and debate has since ensued in questioning this result. If it wasn't for my idea I would be swayed by the argument that the temperature difference comes about from how our sun and solar system travel through the Milky Way. This variation of temperature, aligned with our ecliptic plane was seen both in the WMAP and then again in Planck.

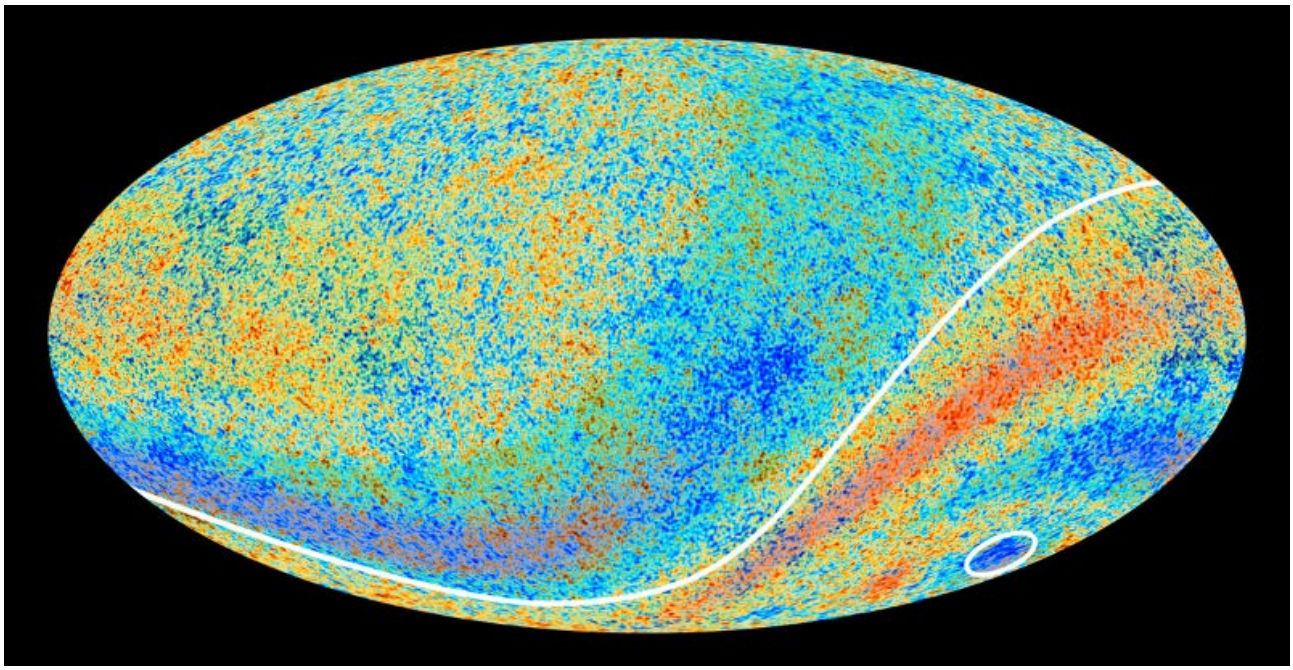

*Fig 34 : High resolution map of the cosmic microwave background radiation showing both the large scale temperature variation between the two axises. The white line running along the axis corresponds to the ecliptic plane of our solar system. The circle, in the lower right region, identifies an unusual cold spot.*

In the context of my idea, everything in our universe was given direction from the start because our universe started as a jet of solid matter. Like exhaust from a jet engine, that stream of matter had a defined direction of travel. Off course, in time it diffused as galaxies formed and grew apart. But like a spaceman floating alone in space with nothing to grab onto did the matter that now composes us group together, all the while retaining its original temporal and later spatial direction, as time unfolded straight lines to give us 4D spacetime.

Fig 34 shows the temperature asymmetry as seen on the high resolution Planck data and even the ESA admits this would require new physics. Notice, also in the Planck image, that cold spot in the southern polar area of the hemisphere.

Imagine a garden hose, you turn the tap on full and a jet of water comes out driven by a pressure differential. Initially, it is one volume of water on leaving the hose. But as the jet of water arcs through the air it divides again and again until it hits the ground as a collection of water droplets.

For the moment let us focus our attention to the spout at the end of the hose. Turn the tap on, water flows out, turn it off and the flow of water out the spout stops. Freeze in your mind the moment in time when the water has just been turned off. At this moment in time the last volume of water has come out of the pipe as the flow stops and hangs frozen in mid air, disconnected from the pipe but still as an initial single volume. Between the water and the spout a volume of air now exists. In essence, this is what that cold spot is. That is, it is the vacuum space between the end of the jet and the Big Bang's event horizon. Namely, cold void or as we see it on the CMB map, as a cold dark spot.


*Fig 35 - Jet of water as it arcs through the air.*

Keeping the arc of water from our hose in mind, similar to above, we see the single volume of water divide into droplets. However a statistical probability distribution follows as to where a given drop of water lands. That is given a random water droplet we can find the probability of it landing in a given spot from this distribution. In the photo above most of the water lands in the river near a spot on the opposite bank directly across from the jet's origin. So it is too with the Dark Flow anomaly.

Galaxy clusters with unexpected velocities have been observed flowing in the direction of the Centaurus and Hydra constellations. The proposed explanation for the unexpected velocity in the movement is because it is being drawn towards a huge mass by the force of gravity. However this

huge mass is said to be beyond our site. That is, it is outside our observable universe, or rather lies over our temporal horizon. But a prediction was made that such a large mass would be visible in the microwave background. Analysis of the Planck data concluded no such mass exists.

I'll go with the simplest explanation. Our universe is like a jet of water, initially a single mass that breaks apart into numerous droplets or galaxies. As the jet diffuses with the vacuum it spreads out. But the important point here is that although the jet diffuses it does so that its given direction, opposite from the cold spot, can be seen as the mean direction of flow. Secondly, that flow is not because of a large unseen mass but rather because our universe had direction from the beginning.

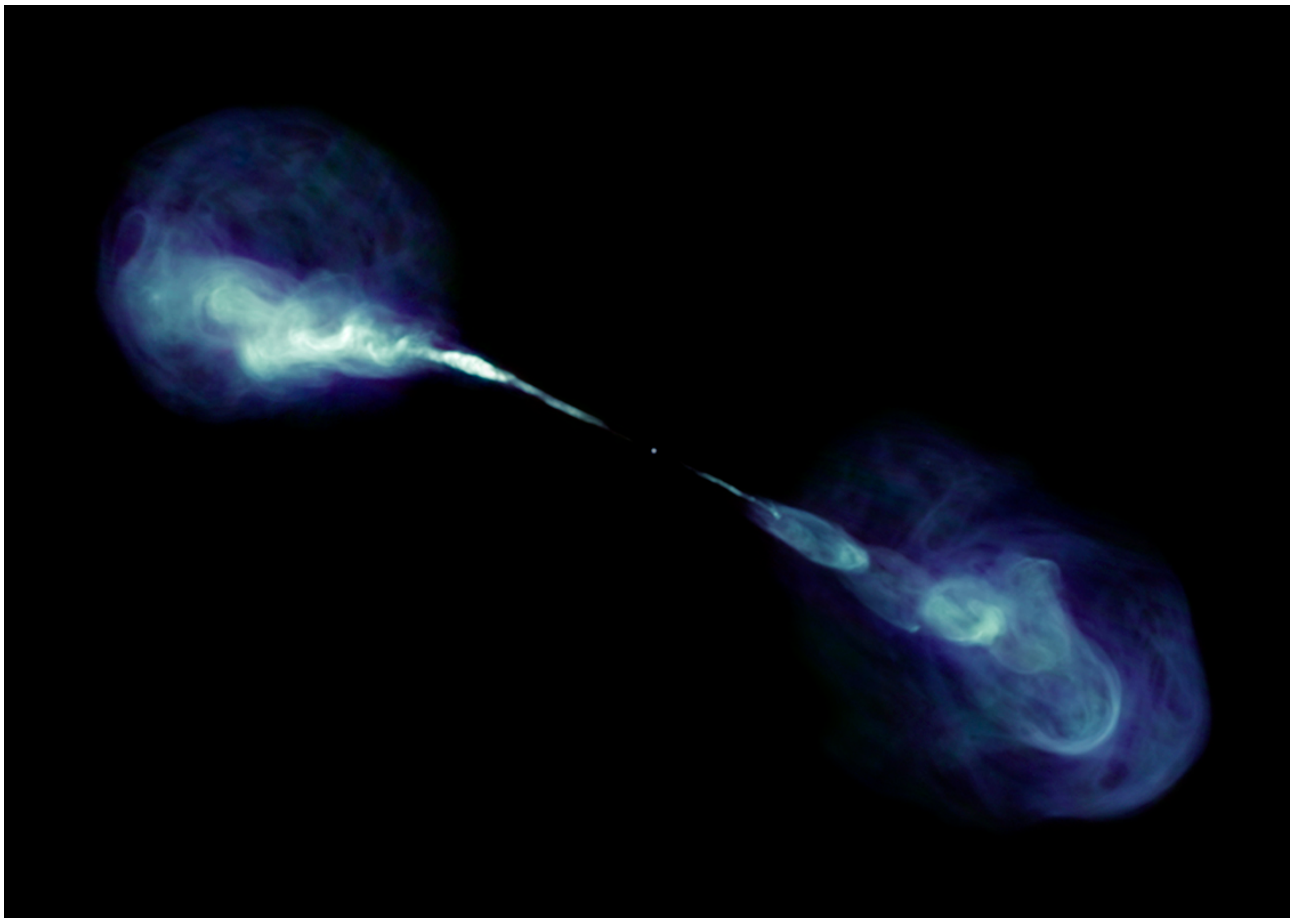

*Fig 36 - Radio of Hercules-a 3c 348 galaxy showing the relativistic jets formed by the active super massive black hole.*

As a next note, I wish to bring up Inflation Theory. In a later section, I'll discuss the Slow Light phenomena where the speed of light is reduced to as much as 17 metres per second. But it has relevance here, as in explaining this experimental result I would say that is because the temporal flow of time within solid matter is cyclic or rather elliptic. Or more accurately, in a solid volume of matter it goes back, in a vacuum it goes forward. As the Bose-Einstein condensate, contained within a defined boundary, can be viewed as half vacuum, half matter. Half the time the photon travels forward, half the time it travels back. In essence, it is going round in loops.

That is the photon, at any moment, is travelling at $3x10^8 ms^{-1}$ but the temporal direction in which travels is constantly changing, half forwards and half backwards, with respect to an external observer. So for every step forward in time the photon takes, in turn it takes a step back in time returning to its original position. Overall, that is the flow of time has been frozen and by the Third Law of Thermodynamics entropy is constant. However, because the Bose-Einstein condensate is

a trillionth of a degree above absolute zero it is not quite stopped but the effect on light can be seen. That is, it seems to travel at 17 metres per second.

How time behaves in solid matter is probably one off the most important aspects concerning time. It is important as we'll start to touch upon in the next section as it is what allows a space traveller to travel across interstellar space instantaneously, with a catch by Special Relativity.

Inflation Theory postulates that the universe in the nanosecond after the Big Bang underwent exponential period of growth. In describing a jet the idea that we originate from a single infinitely small point kind of goes out the window. Rather movement up from an input accretion disc around an event horizon giving rise to polar jets and that is the mechanism at play, as it is the case for an active black hole. This is the exact behaviour you see in Fig 36.

But I feel there is a lot to said for Inflation Theory particularly given the length of the jet before it even starts to diffuse into clouds in the empty vacuum of the void. Looking at the combined image, Fig 37, and where the jet begins to diffuse. It would seem that the spherical region of hot matter, shown in purple, surrounding the galaxy keeps the jet contained to a narrow high energy beam. The cloud is hot gas which in turn keeps the temperature of the jet at a high enough level such that the confinement of the jets beam is contained. I would say this happened in relation to the birth of our universe and the idea of Inflation Theory needs reinterpretation in this light.

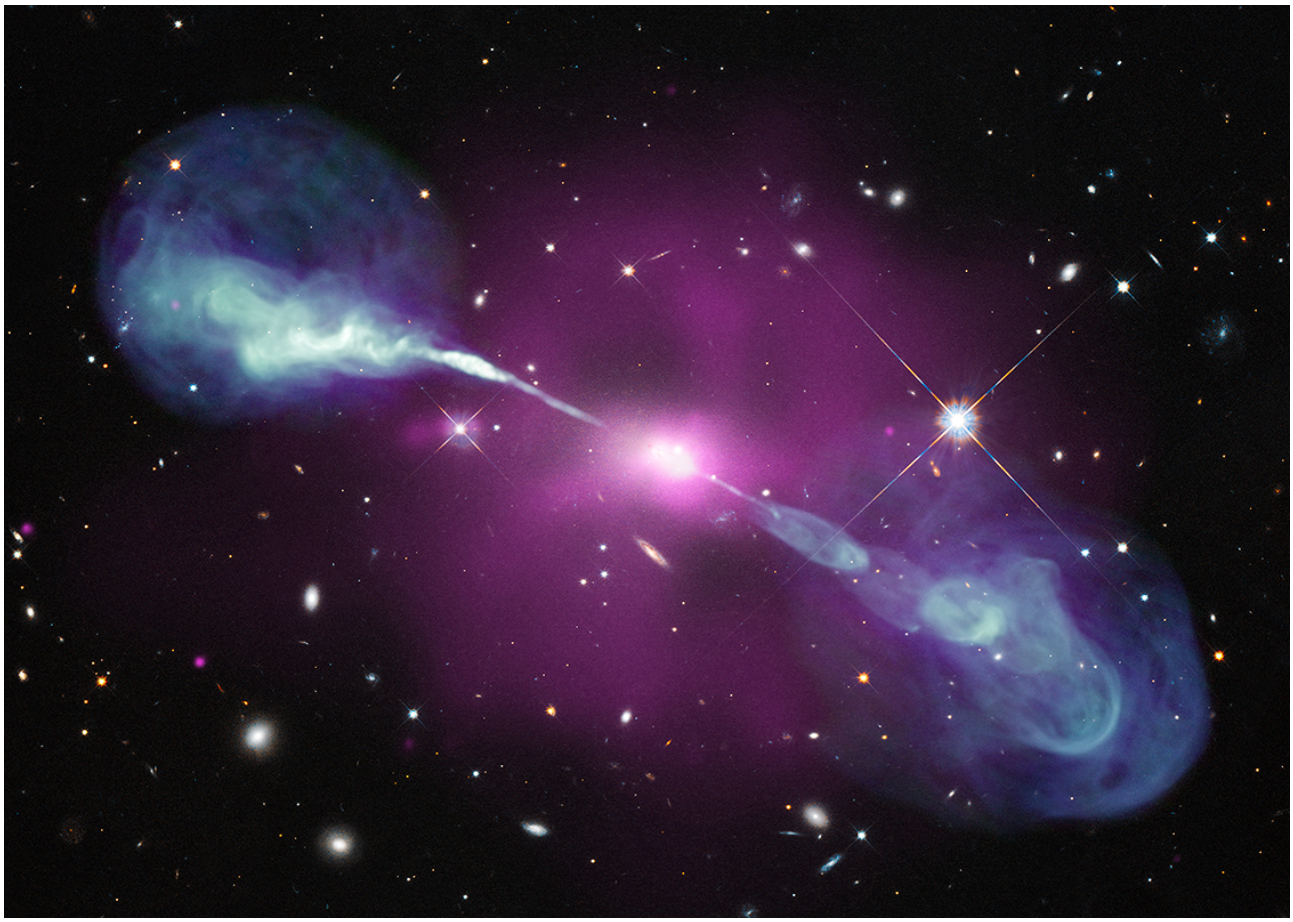

*Fig 37 - Hercules-a 3c 348 active galaxy combined image showing both the relativistic jets and the hot dust cloud, in purple, surrounding the galaxy.*

Firstly, the idea of how much time since the Big Bang or Jet, I should say, is very problematic. Time is in a complete state of flux, hence the discussion of Slow Light. But there was an expansion and it was possible for it to be travelling faster than the speed of light because it was solid matter without vacuum. Although I haven't fully dug into explaining why this is I have tried to

give the tip of the iceberg into my line of reasoning. But in line with Inflation Theory there was a faster than light expansion. The echo of this evidence is as we've seen on the long thin jets from active galaxies or quasars. Trouble for Inflation Theory is that the initial smoking gun evidence may never really existed upon closer examination of the data.

The next piece of evidence from the microwave background radiation we look at is the curvature of it. As listened at number 4 by NASA on its list of achievements the WMAP team "nailed down the curvature of space to within 0.4% of a flat Euclidean" universe. The list of papers concerning this result doesn't leave much room for controversy.

In previous sections I have argued that the process of bifurcation is the underlying mechanism by which we experience a Euclidean geometry. Both at the cosmological scale and at the atomic scale when presenting a new interpretation to how we view the quantum world.

That is space is flat because of the curvature of spacetime changes from elliptic to hyperbolic when it transitions from matter into vacuum where irrotational flow meets rotational flow.

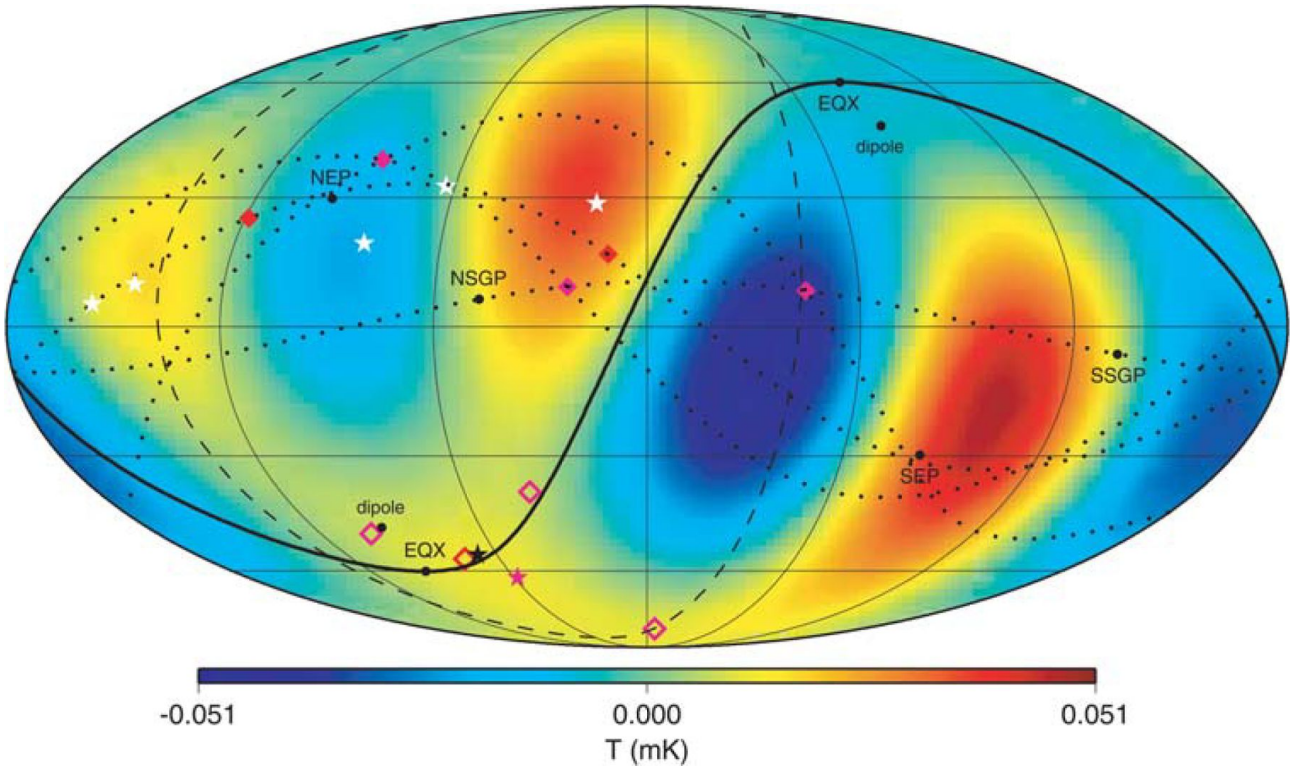


*Fig 38 : The l=2+3 multipoles from Tegmark et al. (2003) cleaned map, presented in galactic coordinates. This is a combination of Fig 9 and 10. The solid line is ecliptic plane and the dashed line is the super-galactic plane.*

Before completing my picture where we return to the discussion regarding the hexagonal structure as seen by Penrose's concentric rings let us look at that the six sided imprint of this hexagon.

As Fourier analysis is to the decomposition of a one-dimensional music composition so to is spherical harmonics equivalent but to a sphere. In short, spherical harmonics is employed to divine the frequency and spectral components of the microwave background radiation across different regions of the sky. Measured in integers, multipole vectors represent the different harmonics within a sphere. Tegmark et al (2003), published a series of maps showing that with a low dipole count the resulting multipole lobes are not statically isotropic as was being expected.

Analysis here has focused on the unusual alignment with respect to the ecliptic plane of our solar system, as well as the galactic plane. That we have already covered. What is even more significant, to my eyes at least particularly in the combined map, is that you can see six lobes. Namely, from left to right, it goes sequentially from hot, cold, hot, cold, hot and last back to cold in Fig 38.

Coming full circle, again below, is the concentric circles with my structural interpretation. In composite with it is a cross-sectional diagram of the jet in line with my description of the bifurcation of the jet from a single volume of matter.

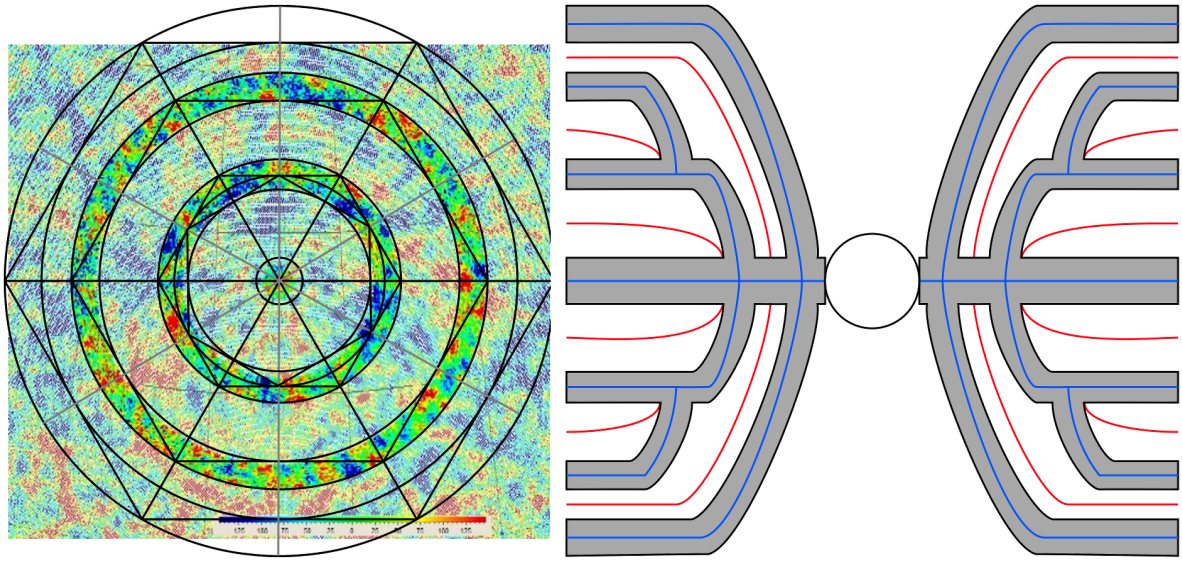

*Fig 39 - Full structural interpretation of the universal jet.*

And that is it. Nice, clean and simple.