1 Quantum Theory

In this chapter I discuss the nature of the exponent which is the building block of reality. I then move onto the waves formed from it and show how some are local and non-local. I also show what it means to square these waves. Importantly, the chapter moves onto the task of reverse engineering the Navier-Stokes equation and representing this using the derived Hamiltonian. The dependencies are worked through such as temperature and pressure etc; Finally, the Navier-Stokes is completed and there is a discussion on how to implement it algorithmically.

Pi-Space can be used for the wave to particle relationship where we have waves and amplitudes which form particles and the rules associated with it. The Pi-Space theory also expands some of the concepts of Quantum Theory to explain how particles bind at the exponent level to form our Observable reality and the overall structure of reality according to this Theory. It also explains how our reality is formed by the Euler Identity Exponential wave function.

In the main, the Pi-Space Theory's objective is to make QM physics more intuitive. To do this, there are some amendments to existing Quantum Theory. The Pi-Space amendments are

1. Describing how Quantum fields are inside other Quantum fields infinitely in both directions (getting larger, getting smaller)
2. Describing how one Quantum field binds to an outer or inner field, sometimes more generically called entanglement
3. Amending the Complex Conjugate to show how this produces up and down Quantum states and theoretically improving upon the statistical model

Also, the goal of Quantum Mechanics from a Pi-Space perspective is to show how Quantum operators and Quantum states can form Cos and Sine waves and also particles. Plus the theory explains how particles become Observable and what that means. So from a Quantum Reality we can form our Pi-Space reality of planets with Gravity and waves and particles.

Let's discuss the steps first to build the framework which incorporates the amendments.

1.1 Irrational numbers and Quantum Operators and State

Let's start with the first building block.

The Exponential function is seen as a Quantum operator with a Quantum state and resulting infinite sequence. It works forever summing a result which is therefore seen as irrational in our reality. The summing of its result never completes which means it is always operating. In the Quantum world, Operators operate infinitely on states. This is the Operator we will focus on to build our reality of waves and particles, some of which are Observable. We can imagine a place where this operator exists.

The power series for the Exponential function is

$$e^x = \sum_{n=0}^{\infty} \frac{x^n}{n!} = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \ldots.$$

This function is the building block of our reality. It needs to be amended a little to produce Sin x, Cos x, Circles and Spheres of different sizes which we call Pi-Shells in the theory. However, the key point about this series is that it is an infinite series. This will work infinitely inside our reality and never stop. It will build a structure and it will remain because the operator works infinitely.

1.2 QM Fields within Fields in Pi-Space

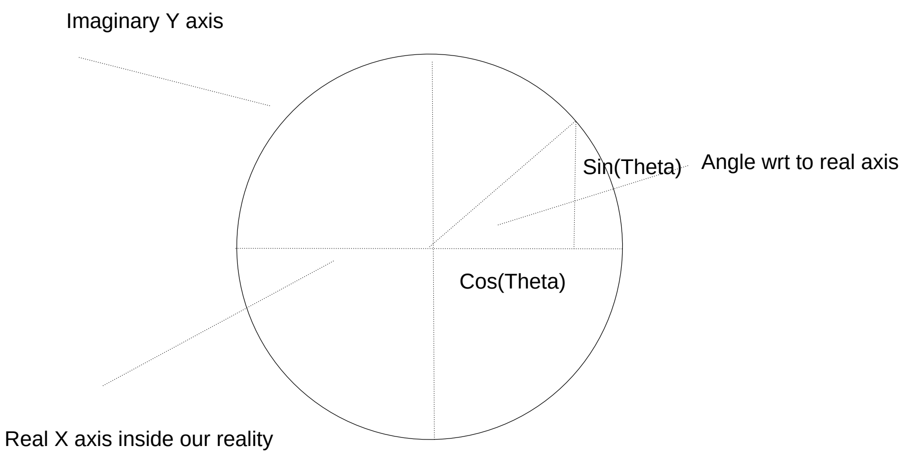
In our reality we have the concept of things which are bigger and things which are smaller. These measurements are always relative to us, for example the Meter. An atom is ten to the twelve times order of magnitude smaller than us. On the other hand, our planet has a diameter of some thousands of miles. The Milky Way is measured in light years and the Universe which started from a tiny point of nothing is almost immeasurable compared to us.

How do we model larger and smaller Pi-Shells so to speak and spheres within spheres infinitely in both directions?

The answer is a special version of the Exponent (Euler's Identity) which supports circles and spheres (where the diameter is squared according to the Pi-Space Theory).

$$e^{ix}$$

e^iPi (Euler's Identity)

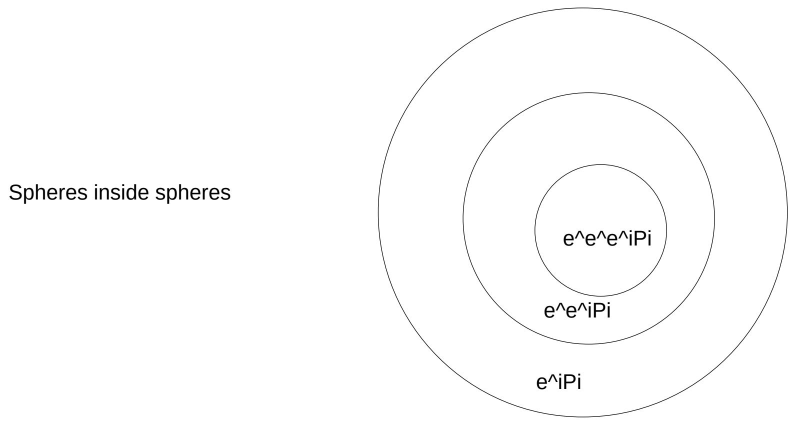


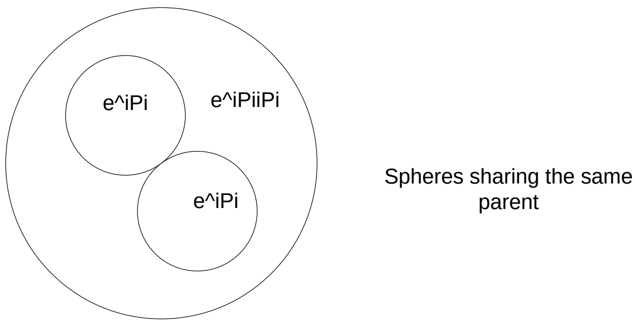
For the purposes of this discussion, we assume this can build a sphere. Some can be larger. Others can be smaller. Later I'll discuss Euler's Identity with the details of this.

Let's also assume an exponent operator can be inside another exponent operator. So each part of the Infinite Series can itself be an Exponent operator which is another infinite series which can build more geometric structures.. Therefore parameter x can itself be an exponent. There can be many parent child relationships. x' is a child of x.

$$x = e^{ix'}$$

So we can have Spheres inside Spheres infinitely. Later, I'll discuss how one Exponent can be larger than another when we focus on the diameter. We can also have spheres having the same parent Exponent function.





Note: These can be infinitely larger or smaller. Pi-Space models our Universe as our largest known Pi-Shell. Therefore, outside our Universe there could be a cluster of other Universes and it could theoretically go on forever. Each Pi-Shell generates a Quantum field and we can see from this that x' can be bound to its parent Exponent function.

Pi-Space considers that Observables which appear in our reality must "bind" to our parent Exponent function. Pi-Space enhances the current Quantum Mechanical Complex Conjugate but does not dispute its correctness or validity.

Therefore in Pi-Space the rule of thumb is that for something to become Observable it must be bound to the same parent Exponent as the Observer, otherwise you won't see it. Put another way, it must be entangled with the same parent exponent function as you. For the purposes of this discussion, when I talk about the exponent function, I am referring to Euler's Identity.

There are simple geometric rules for binding which I'll explain shortly.

Next let's understand the changes to the ordinary Exponent function which make it operate like Euler's Identity.

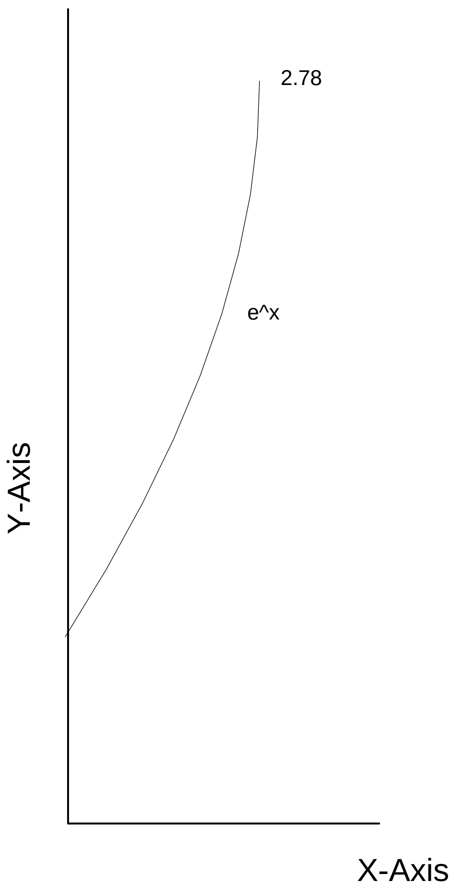
1.3 Building Our Reality From the Exponential Function

Let's begin the process of building our Universe with the Exponent function. Please note that Schrodinger's Wave Function uses this wave function at the heart of it, so once we understand this, we can then show the meaning of Schrodinger's wave function which also includes Kinetic and Potential Energy.

Let's conduct a thought experiment where we have an imaginary gun which can shoot out the results of the simple Exponential function and then amend it. The idea is eventually to shoot out a particle and even a sub-atomic one which behaves like an electron.

First we imagine that there is nothing but an empty Universe where there is nothing but the Exponential function at every point. It is seen as a Quantum operator, constantly acting on some state and producing a new state. Many in the QM community model this as one Matrix operating on a vector space.

We fire the gun and have the gun set to value 1. What is produced is a curving result which goes out in the x-axis by y and ends up at value 2.71828182845905 approximately, the natural exponent. However this beam never stops working but it's stuck at this y point. We can't build our reality with this, so we need to add something.



The next step is to add two Quantum Operators that are quite familiar to us but we don't call them Quantum operators in our reality. Quantum operators just take a Quantum Sequence such as that generated by the Exponential Infinite series and alter the sequence in some way. I won't say what we call them for now but it'll become clear. I will slowly add them one at a time. Let me add them next.

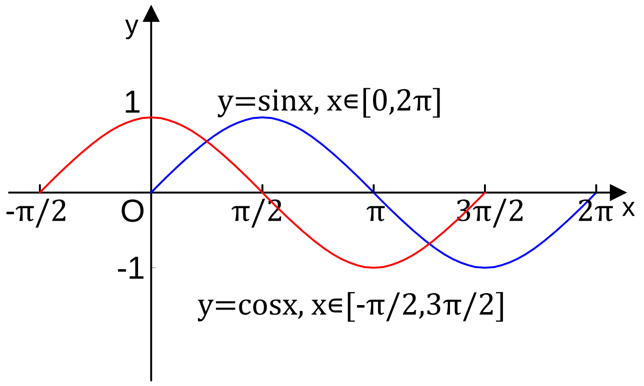
The two operators each do the same function. Each changes the sign of the value of the Exponent series to another sign. Also they act as a pair. So we can model them in the following simple way.

++,--,++,--,++,--

Like the Exponential function, these operate forever. Therefore, the new Exponential function is.

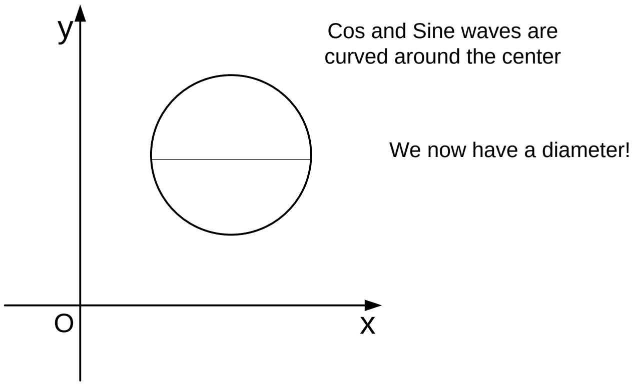
$$e^x = \sum_{n=0}^{\infty} \frac{x^n}{n!} = 1 + x - \frac{x^2}{2!} - \frac{x^3}{3!} + ...$$

Now if we fire the gun, we get a new result. We get a beam. Interestingly, if we zoom in on this beam, we see that it's a combination of two waves which match Cos and Sine. So we have waves! What's really useful is that the -1,-1,+1,+1 Quantum Operator has also produced a new constant called Pi which is a product of applying this quantum operator to this infinite series. Every Pi/2, the cycle completes and restarts again moving in the opposite direction. What's happened is that the simple addition of these paired operators has generated an Infinite series which cycles.



So we have something close to a particle but we're not there. These waves have no mass! We need to add our concept of mass and the idea is that we can form a circle and then later a sphere.

Now we take another step into Quantum Mechanics, we make another very simple change. We take the two operators and make them **perpendicular** to one another and form an elementary axis. This means we create a space which can be deemed as a elementary Quantum field. Now what do we get? The answer is that we get a circle with area. Each point in the circle is a combination of x.Cos and y.Sine moving about this axis. The gun now fires some kind of elementary particle. Each point on the circumference is now a combination of Cosine and Sine and we suddenly have the world of trigonometry.



Importantly we have the next building block of reality. We have a diameter! Also, we have new properties such as Pi*d = Circumference of this circle, plus Pi*d^2 gives us the Sphere which forms an elementary particle. The Cos and Sine waves have been bent around an origin but the whole circle can move forward. If this circle contains other exponent functions theoretically we can have circles within circles which could be thought of as some kind of elementary mass.

The key point is that the axes of the ++,--,++,-- quantum operators are Orthogonal to one another. When they are orthogonal, we can see them as two different parallel series +-,+-,+-. The Sine is addition and the Cos is subtraction orthogonally. Therefore +- is orthogonal. Also, -+ is orthogonal.

1.4 How We Define An Observable And Pi-Space Binding

Now we move into Pi-Space and how it describes Quantum Mechanics Observables. Put another way, something which we can measure.

Before I do this, in the current QM theory, for this object to appear, the squaring of the complex conjugate represents the probability of the particle appearing from the gun. We don't know exactly where it will appear.

For Pi-Space, in order for the particle to bind with our reality and to become Observable, then one of the orthogonal axes which I have shown is a Quantum Operator must belong to our parent exponential infinite series and one must belong to the child Exponent generating the other axis. In other words +- must belong to two different exponent functions provided by parent and child.

So all this means is that the parent operator is shared with the Observer such as the scientists running an experiment. If this is not the case, then we have what is called an object which is not observable for an observer sharing a certain parent exponent and has an imaginary axis. Typically, this is described as an untangled wave function.

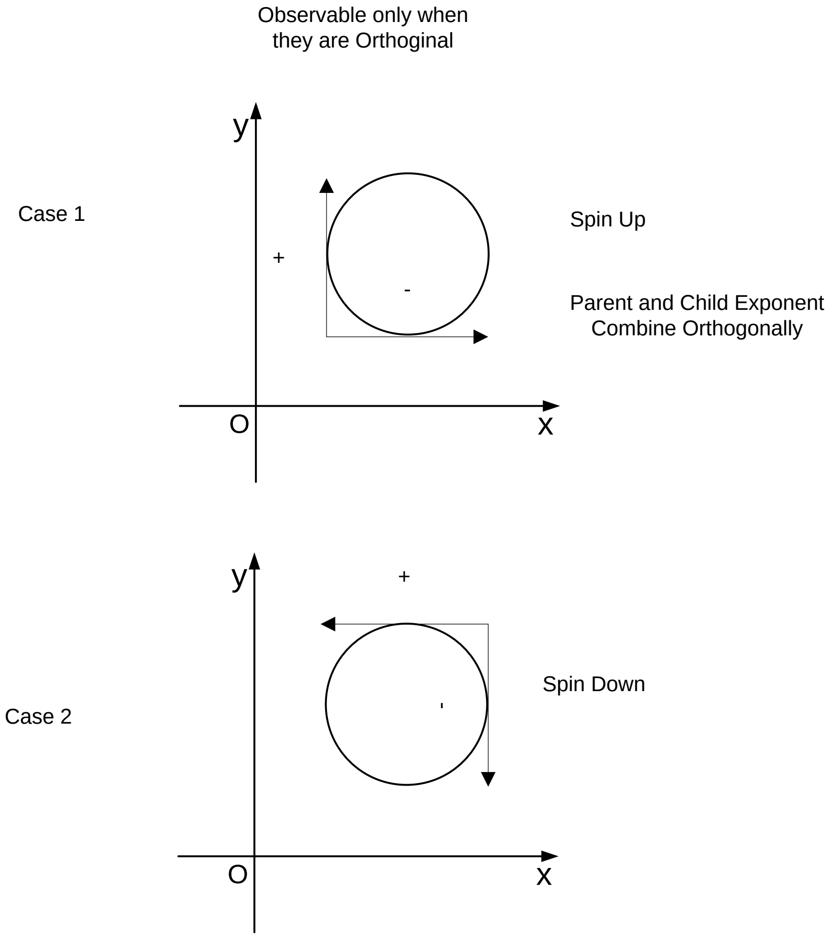
Euler described this in his Euler's Identity which is a **very** famous formula using an imaginary axis.

$$-1 = e^{i\pi}$$

In Pi-Space what this means is that one Exponent y axes is not fully bound with another and is therefore not observable. You can map this imaginary axis to an unbound operator in Pi-Space. If we do not have an imaginary axis then parent and child are bound or fully entangled and both are "real".

So precisely, what is binding? It's the binding of one Infinite Series with another where certain geometric rules apply which I will define.

So let's take the two cases of how one Exponent function can bind with another. It's at this point according to the theory that the wave function of the child is said to "collapse". The two infinite Series have joined forces so to speak so they are orthogonal to one another. There are only two possible cases. They must be orthogonal and therefore opposite in direction to form an observable particle.



These are called Spin-Up and Spin-Down in Quantum Mechanics. The important point to note here is that **orientation** is important here because one of the axes is that of one parent Exponent function and one child Exponent function. This is why you only see particles appear in certain positions and orientations with respect to the parent Exponent function. Currently we do not measure this parent function and this is the amendment in Pi-Space. However, if you place an electron in certain positions and orientations within a magnetic field which in theory is the parent exponent field, then orientation to this field determines the behavior of that electron.

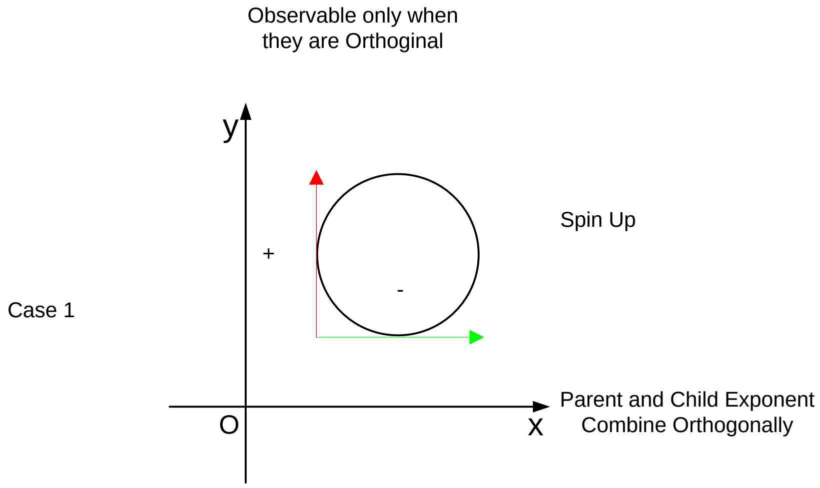
This is also why for example, light has two forms of polarization and electrons have spin-up and spin-down. This indicates which type of binding has occurred with the parent Exponent function.

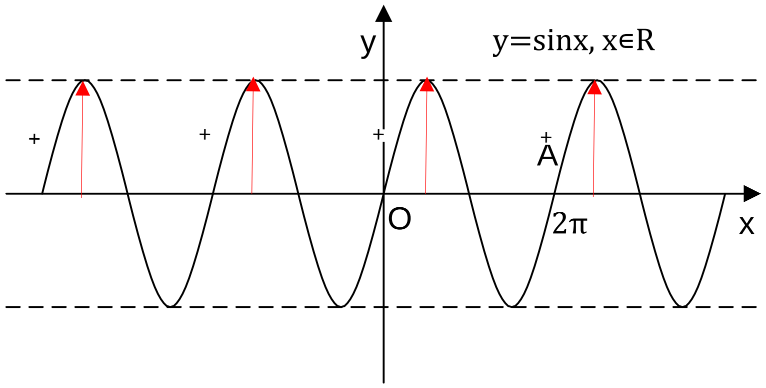
Much of the Math of Quantum Mechanics is to do with measuring orthogonal vectors using the dot product and also of defining operators on the Quantum Series. Dirac extends the <|> notation which he famously called Bra-Ket but it’s really just all about dot products and measuring orthogonally in conjunction with Quantum operators like the ones I just mentioned. However, it’s a powerful notation but can be challenging and also conversely rewarding.

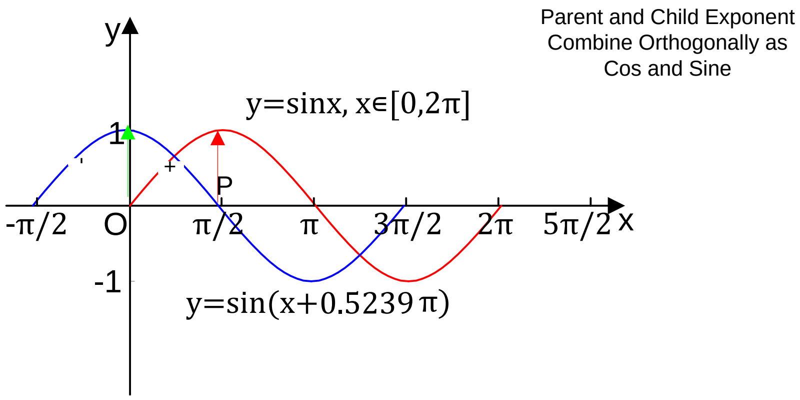
1.5 Defining the size of the arrows and wave amplitudes

Let’s define the size of the individual arrows. In the first case, they are orthogonal to one another and this is what causes the circle / sphere. In the second case, each point along the circumference is a combination of Cos and Sine.

So what we have are two waves combining with one another at right angles. Their combined Cos and Sine values squared equal 1. If we consider a wave, the maximum point of its wave function amplitude is at Pi/2. So we can assume the maximum amplitude value is 1 and this relates to the diameter which I will explain.







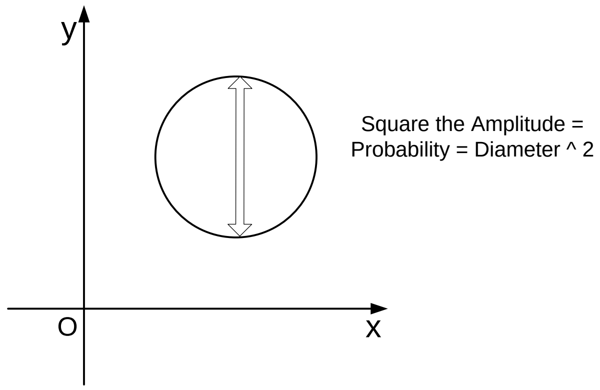
This may seem a bit confusing because the diameter is larger than the wave amplitude. In the smallest case of two orthogonal waves, then the diameter is also 1 but this is really the smallest possible Pi-Shell. This is where kinetic and potential energy become important now that we have a diameter. Recall that in Pi-Space for Special Relativity, Kinetic Energy=amplitude/diameter getting smaller, PE =amplitude/diameter getting larger. So when we see a particle whose diameter is greater than its amplitude and moving relative to an Observer then, we have both Kinetic Energy and Potential Energy. This will be further described when I explain the Schrodinger wave Equation which deals with Potential and Kinetic Energy and the wave function.

1.6 Consequence of Measuring Just One Orthogonal Axis or Amplitude

So, if we cannot measure the parent wave function (or alternatively if we are not aware of its existence) and know only the child wave function which is the product of the child exponent functions, then we can be sure that when this child wave function reaches its highest amplitude squared, we can state that there is a high probability that a particle can appear here. By not knowing when the parent wave function reaches its highest amplitude, we are forced to deduce the result by probability theory.

According to the Pi-Space Theory, what this means is that Einstein was correct. God does not place dice with the Universe according to this theory. So in Pi-Space there is two QM dice being thrown to form an observable; not just one. However, the current QM approach is the best guess one can make knowing only the child wave function so in a certain sense they were not doing anything wrong. Experiments prove this.

We can only truly know where a particle can appear according to Pi-Space Theory if we can only truly model a time based wave function in our reality for any particular experiment or situation, similar to what has been done for the child Exponent function such as a electron wave in an atom knowing **both** the parent and the child wave function.



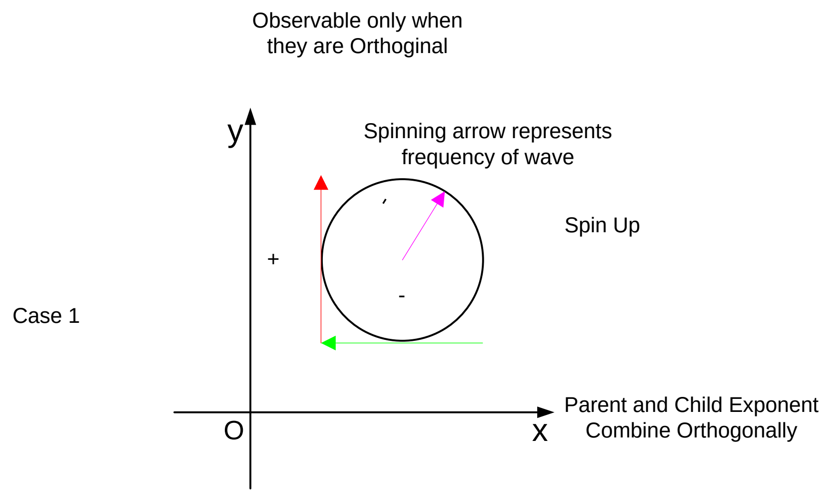
Note: The fact that we have also squared the diameter also means we have created a Sphere which is more commonly called a particle or atom. From there we can use the Pi-Space Special Relativity amendments.

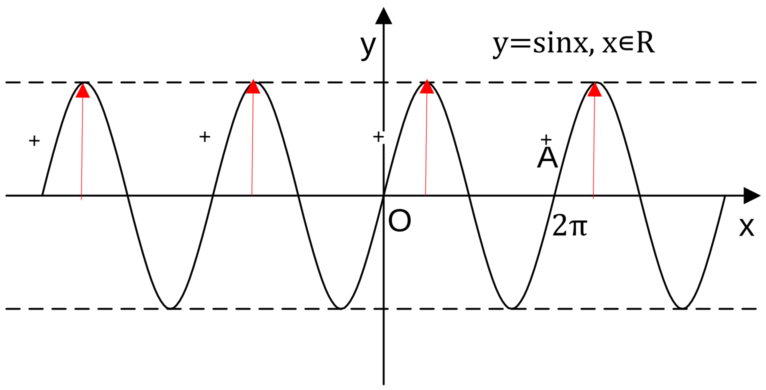
There is also the vexing question in QM where one asks, how does the electron know it has chosen spin up or spin down? The parent QM field is the field which "knows" because this is the one which the child exponent field is bound with or entangled. This is the Exponent sequence which had been altered by the binding.

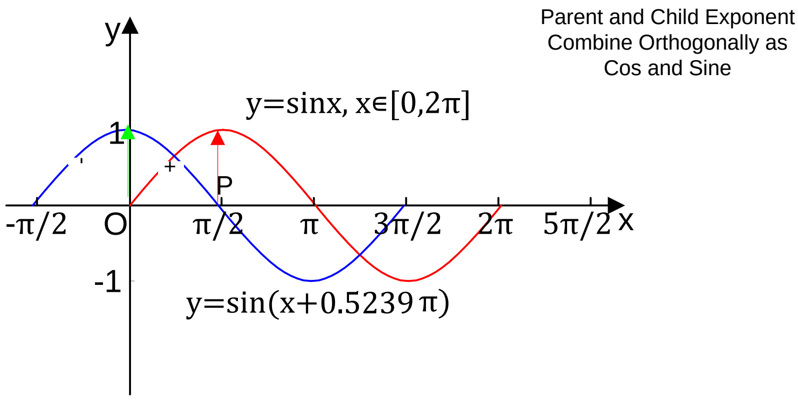
There is also the issue of Locality versus non Locality. The Exponent functions are non-Local according to the Pi-Space theory because they build the waves and the spheres. To someone inside this sphere and wave reality a quantum operator change might appear instantaneous but it does require work for the Exponent function itself. Speed of light will be discussed later.

1.7 The Arrow Notation For Waves

It's important to also know the rate of change of the Sine or Cos wave. In other words, how fast it completes a cycle or frequency. One way this is done visually is by drawing a spinning arrow inside the Euler's Identity axis. Ideally, it spins one way for Spin-Up and another for Spin-down. If two particles have the same diameter, the arrow spins at the same rate.







Next, we discuss the foundational formula of Quantum Mechanics, Schrodinger's Wave Equation. For the most part all of what I have described is contained in his wave equation, excluding the Pi-Space amendments.

1.8 Defining the smallest Pi-Shell

Let's define the smallest possible Observable or Pi-Shell. This will have a diameter of 1 and therefore it's comprised of two orthogonal axes. We can use the Pythagorean Theorem. Therefore this gives us to equal sized orthogonal axes having relative lengths

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

Therefore, in QM we get 1/Sqrt(2) which is just the Pythagorean Theorem. If we make the diameter greater than 1 we need to add Kinetic and Potential Energy.

1.9 Schrodinger's Wave Equation

Now that we have defined the meaning of the wave function and how it is derived from a special version of the Exponential operator with some quantum operators, we need to explain how to derive the Schrodinger Wave function in Pi-Space.

If we want a Pi-Shell to get larger, we place it inside a Potential. All this means in Pi-Space is that the diameter gets larger as one moves away from the center of a Pi-Shell.. For example, in a Gravity field, I've shown that an atom gets larger in a Gravity field as we move up. This is just a larger Pi-Shell. If an electron is inside an atom, this is also a Pi-Shell. The further the electron is from the center of the electron, the larger its diameter or Potential Energy. In Pi-Space the way we define this for Gravity is

$$\frac{gh}{c^2} = 1 - Cos\left(ArcSin\left(\frac{v}{c}\right)\right)$$

The term on the left is the Potential Energy and the term on the right is the Kinetic Energy. One could imagine adding them together and calling this the Hamiltonian for the Pi-Space. For now we exclude mass. I'll add it at the end.

A diameter shrinking is Kinetic Energy. All this means is that the Pi-Shell gets smaller and moves faster relative to an Observer.

Schrodinger took the Hamiltonian which sums up this idea and applied it to the wave function. H=KE + PE. Now as I've shown KE is a diameter or amplitude shortening, so we apply a minus sign. Therefore H=-KE+PE.

$$HE = (-KE + PE) * (WaveAmplitude)$$

$$HE = -KE * (WaveAmplitude) + PE * (WaveAmplitude)$$

Essentially he just added diameter gain to diameter loss and applied it to the child wave function. In Pi-Space, the electron wave function is referred to as the child wave function and the parent wave function is the containing field generated by the parent wave function. Presently in Physics we do not calculate this, so we then use Probability Theory. All this means is that we Square the Diameter of the Observable or in traditional QA, the Amplitude. We don't know when the Parent wave function reaches its maximum amplitude in the orthogonal axis so we know the places where the Observable could form.

Shrodinger derived it as follows. He did not have velocity v in his calculation but used the smallest possible diameter defined by Planck's Constant. The wave function with respect to time is.

$$i\hbar\frac{\partial}{\partial t}\Psi(r,t) = -\frac{\hbar^2}{2m}\nabla^2\Psi(r,t) + V(r)\Psi(r,t)$$

Therefore we can make this formula relativistic as follows for a Gravity field

$$i\hbar\frac{\partial}{\partial t}\Psi(r,t) = -\left(1 - Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\right)\Psi(r,t) + \frac{gh}{c^2}\Psi(r,t)$$

Which produces

$$i\hbar\frac{\partial}{\partial t}\Psi(r,t) = \left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right) - 1\right)\Psi(r,t) + \frac{gh}{c^2}\Psi(r,t)$$

Leading to

$$i\hbar\frac{\partial}{\partial t}\Psi(r,t) = Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t) - \Psi(r,t) + \frac{gh}{c^2}\Psi(r,t)$$

We need to add mass m.

$$i\hbar\frac{\partial}{\partial t}\Psi(r,t) = m*\left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t) - \Psi(r,t) + \frac{gh}{c^2}\Psi(r,t)\right)$$

Where

g = gravitational constant,
h = distance from center of gravity
v = velocity relative to stationary observer
c = speed of light
m=mass

This is the Relativistic version of the Schrodinger wave equation. The Units are C^2. This formula in Theory bridges the gap between Quantum Mechanics and Einstein's Theory of Relativity.

1.10 Squaring the Amplitudes to get the Probability

Here is a simple proof of why you need to square the QED amplitudes to get the observable particle probabilities using the Pi-Space theory.

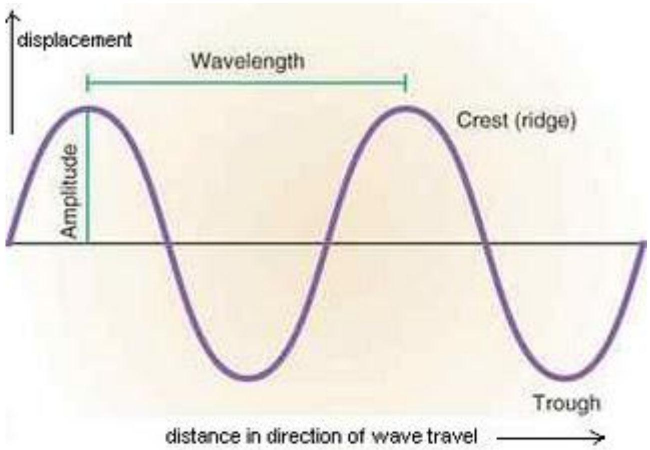
In Pi-Space an observable is defined by the Square Rule.

It has a diameter and an area.

The area of a Pi-Shell / particle / atom which defines its energy is Pi*d^2.

In Pi-Space we use this to calculate Kinetic Energy and overall Energy for a moving particle or Atom for example.

In the Quantum realm we can think of the amplitude of a wave being the diameter of a potential observable Pi-Shell which can represent an Observable Particle. It follows a wave function with respect to time. Some waves change amplitude quicker than other and have different names e.g. x-ray or microwave. At certain moments the wave is at its maximum at other times, it has a value of 0. Waves can combine to form larger waves.



A wave can enter a detector and becomes an observable entity. By this, I mean, we form a Pi-Shell or particle from a wave, how can we calculate this in Pi-Space? This may be because the light wave has a high enough amplitude at a certain point to form a particle within an atom.

Simply, we use the Square Rule, Area of Particle = Its Energy = Pi*d^2

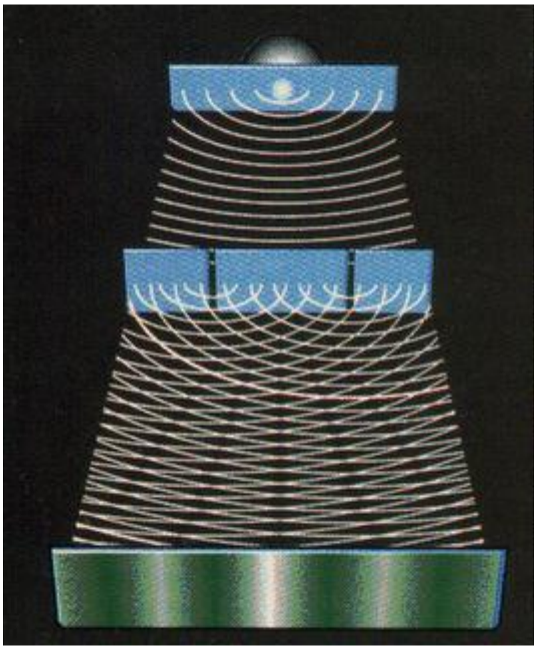
Now d = amplitude

So we can simplify to Probability for Observable Particle = Amplitude ^2

When a Probability appears it binds with our reality and we add the constant Pi.
So its Observable Particle = Pi * Amplitude ^ 2

Also using the Pi-Space Theory, I've shown when we want to add Pi-Shells together, all we need to do is use the Pythagorean Theorem or the Law of the Cosines. See my posts on how to calculate orbits for example. Mostly, you need to build triangles and add them. This is also how you calculate the Lorentz-Fitz Transformation. It's the Pythagorean Theorem or the Law of the Cosines which is the more general solution. Once more, in the Feynman work, to add two amplitudes together, you guessed it, you form a Triangle which is just Pi-Shell (Observable) addition. In this case, the vertices are the amplitudes and the Pi-Shells are the Observable particles.

Also we can see that the larger the amplitude, the larger the intensity of the light at that point.



When we say that the wave function "collapses" what this means in Pi-Space is that a particle aka Pi-Shell is formed, typically within a larger Pi-Shell or Atom. Therefore it behaves like a particle.

If for example, a detector (like in the slit lamp) uses a technique where the wave is collapsed to a particle by means of detection then the slit lamp will not produce a wave effect.

1.11 Euler's Identity for QM

In Quantum Mechanics, a foundational formula is Euler's Identity and is used to define the QM Wave functions.

$$e^{i\Pi} = -1$$

Which is the same as

$$e^{i\theta} = \cos\theta + iSin\theta$$

This can be seen as a foundational Pi-Space Theorem. Remember in classical Pi-Space covering Special Relativity that Cos is seen as the compression of a Observer Pi-Shell and Sin is seen as a Observer Pi-Shell getting larger due to velocity based movement using the classical approach. We use units ArcSin(v/c) for velocity in the Gravity and Special relativity case. Recall Cos(ArcSin(v/c)) is actually the Lorentz-Fitz Transformation.

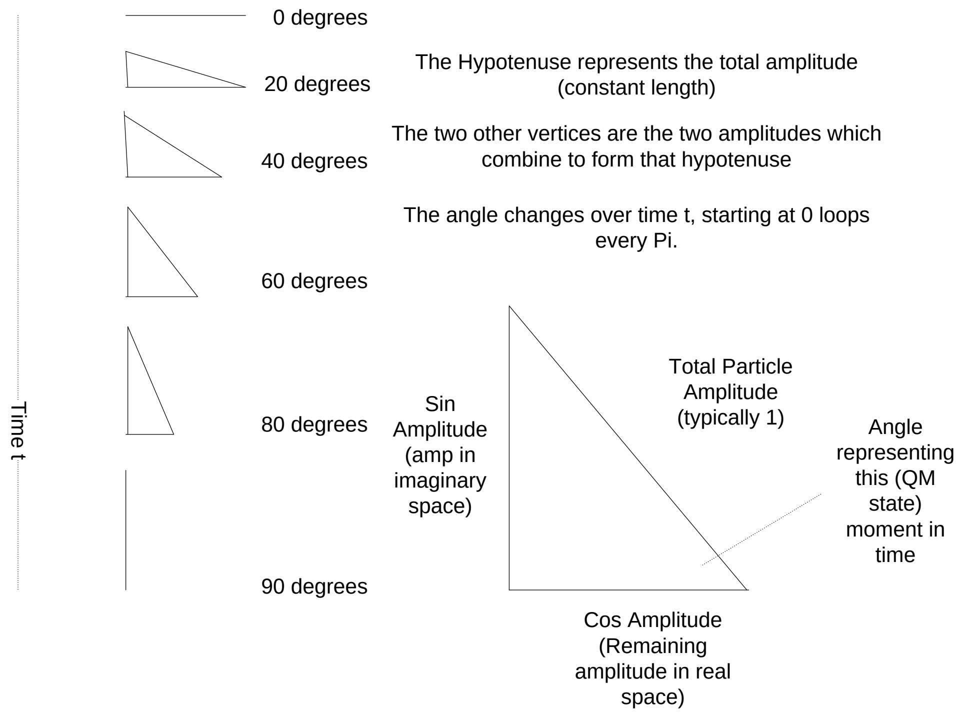
In this case however, we are dealing with Quantum Mechanics so we use the imaginary axes i to represent notional quantum space. This represents probability amplitude which is changing with respect to time. The angle θ represents the degree of amplitude change with respect to time. Euler's Identity shows us how to add amplitude components and uses the angle θ to represent the rate at which the amplitude change occurs. X-Rays for example will change θ faster because they have higher energy.

Some cases.

Cos θ. At θ = 0, Cos(0) = 1 meaning the maximum Particle amplitude value in real space At θ = 90, the Particle has no presence in real space.

Sin θ. At θ = 0, Sin(0) = 0 meaning the Particle has no presence in imaginary space. At θ = 90, the Observer is no longer present in real space and is in imaginary space.

Amplitude as Angle Increasing OverTime



Therefore we can see Euler's Identity for QM representing a possible particle existing in our reality by modeling the changing probability amplitude.

There are four distinct states.

Recall that Pi^*(amplitude^2) represents the particle area in Pi-Space. Euler's Identity models the changing amplitude.

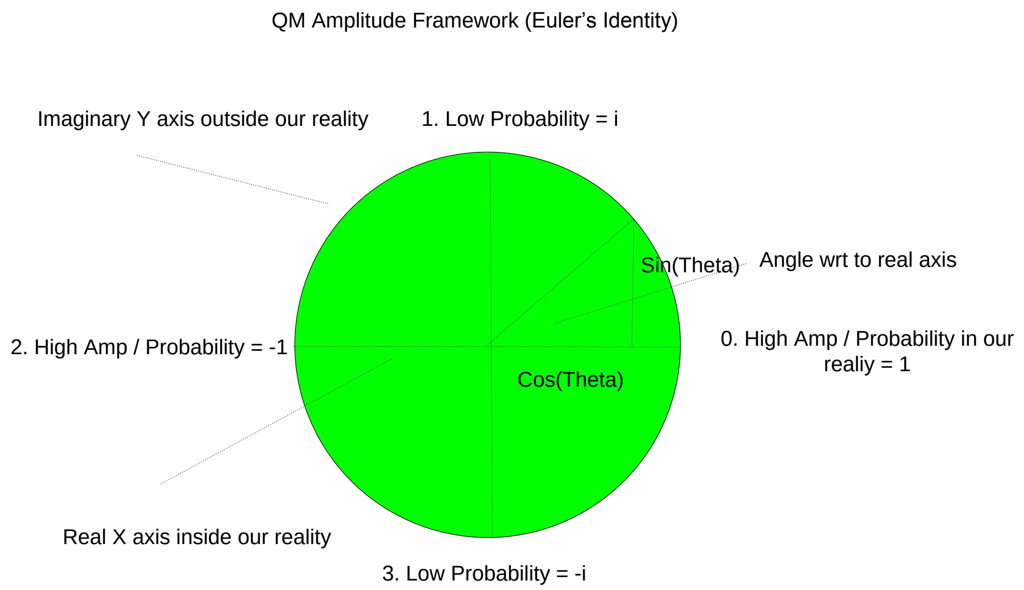
State

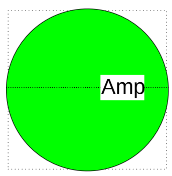
0. The angle θ starting at 0 represents the highest amplitude (1) or presence in our reality.

1. The angle θ starting at Pi/2 represents the lowest amplitude (0) or presence in our reality.

2. The angle θ starting at Pi represents the highest amplitude (-1) or presence in our reality.

3. The angle θ starting at 3Pi/2 represents the lowest amplitude (0) or presence in our reality.





Real Amplitude Squared = Probability
Observable Particle = Pi ^ Amplitude Squared

For the most part, we are modeling Cos as the mechanism for real space as this is the real axis. The Sine component is a way of representing the amplitude lost to "another place". We call this place imaginary but really all that's happening here is that a particle is dropping in and out of our reality at a certain rate. The wave function represents this and it is typically drawn this way with a frequency and amplitude.

We use the Cos wave as the real probability amplitude. Note: There may be more than one Cos forming the total wave. I'll describe how to handle this later. It's the same approach we used in Classical Pi-Space for Gravity.

To square this amplitude, we form a potential particle. By this, I mean, it has the possibility of appearing in our reality.

Important Note: The final part of this QM and the part which Pi-Space adds is that we model the chosen particle with Pi * d ^ 2 where d = probability amplitude. The constant Pi is not trivial. The presence of constant Pi means we have the presence of a wave behavior within an infinite series.
What Pi-Space adds is the constant Pi. What this means is that once a particle is "formed" or "chosen" to appear in our reality, it binds to the constant Pi. Therefore Pi is seen as a Probability distribution function / field in which all matter exists. This is the mechanism

which chooses which particle appears where. It chooses the particles to appear equally but randomly.

Therefore Pi is the mechanism which selects matter to appear in our reality according to the Pi-Space Theory. It is not just a constant. It is everywhere like a field and regulates the probabilities into well defined forms such as waves and spheres. This is the meaning of the constant Pi in the Pi-Space Theory.

1.12 Forming an Observable from two QM Wave Functions

In QM, wave function postulates are as follows.

Single valued probability at (x,t)

$$\Psi(r,t)$$

Probability of finding particle at x at time t provided the wave function is normalized.

$$\Psi(r,t)\Psi(r,t)*$$

The Pi-Space amendment for two wave functions is that one can find the particle at x at time t provided both wave functions are normalized.

$$\Psi(r,t)^1\Psi(r,t)^2*$$

Specifically

$$\left(-\frac{\hbar^2}{2m}\nabla^2\Psi(r,t)+V(r)\Psi(r,t)\right)\left(m*\left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t)-\Psi(r,t)+\frac{gh}{c^2}\Psi(r,t)\right)\right)*$$

When Schrödinger proposed his wave function and it was later turned into a "probability" he apparently said…

I don't like it, and I'm sorry I ever had anything to do with it.   -Erwin

In Pi-Space, we can show that the wave function can in fact (theoretically at present I advise!) produce where we can actually "find" the particle if there are two of them. For this reason in Pi-Space, I name this function – *Schrödinger's Wish.*

1.13 Falling Into a Black Hole or The Big Bang

Falling into a Black Hole is the same as the Big Bang. We roll everything back to the beginning or mass is totally compressed inside a Singularity. The function I have shown can handle this case. Let's look at it and see what it tells us about the Big Bang or mass inside a Black Hole.

$$\left(-\frac{\hbar^2}{2m}\nabla^2\Psi(r,t)+V(r)\Psi(r,t)\right)\left(m*\left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t)-\Psi(r,t)+\frac{gh}{c^2}\Psi(r,t)\right)\right)*$$

The left hand size becomes 0 because all the atoms are gone, the protons, electrons, the standard model particles are all compressed to a single point. However, this does not mean there is information loss. It hasn't disappeared. All this equivalent mass is still present on the right side of the equation which does not go to 0.

$$\left(m*\left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t)-\Psi(r,t)+\frac{gh}{c^2}\Psi(r,t)\right)\right)$$

On the right hand side, we have all that mass inside the intense Gravity field now. However, even Gravity (Kinetic Energy and Potential Energy) has collapsed. Velocity equals the speed of light there v/c=c/c=1 which means complete compression of mass. Also our distance h from the center of Gravity is 0. Let's see what the formula gives us.

$$\left(m*\left(Cos\left(ArcSin\left(\frac{c}{c}\right)\right)\Psi(r,t)-\Psi(r,t)+\frac{g0}{c^2}\Psi(r,t)\right)\right)$$

This simplifies to

$$m*(-\Psi(r,t))$$

What this is telling us is that all the mass in the Black hole is totally converted into a Quantum Wave Function which is losing area with respect to time (Cosine wave), times the mass.

Let's take an example of Planet Earth and work it out.

Previously in the advanced formulas section for Gravity, I derived the Schwarzschild radius for Earth as follows. If you're unsure about this please take a look at the Advanced Formulas doc.

$$\frac{\left(\frac{GM}{r}\right)}{c^2}=1-Cos\left(ArcSin\left(\frac{c}{c}\right)\right)$$

$$\frac{\left(\frac{GM}{r}\right)}{c^2}=1$$

$$\frac{GM}{r}=c^2$$

$$\frac{GM}{c^2} = r$$

$$r = \frac{GM}{c^2}$$

Earth mass is 5.98*10^24 Kg

Therefore considering Earth, the back hole radius is

Pi-Space derivation
(6.67*10^-11)*(5.98*10^24)/(299792458^2)= 0.00443798 = 4.4 mm approx

So the Earth collapse to an Event Horizon with diameter 4.4 mm

And we now know from the Pi-Space Quantum Theory formula all there is left is a wave function times the mass.

$$m * (-\Psi(r,t))$$

Which gives us

$$5.98 * 10\text{^}24 * (-\Psi(r,t))$$

Let's calculate the Wavelength of this Black Hole Cosine wave. Note: We could also do this for the Universe as well if we knew the total mass of the Universe. I leave that up to an interested reader. For now, I focus on Earth, turned into a Black Hole.

De Broglie showed us

$$\lambda = \frac{h}{mv}$$

Velocity v = c = 299792458, meaning complete compression, therefore

$$\lambda = \frac{6.626\text{^}10 - 34 J.s}{5.98 * 10\text{^}24 Kg * 299792458\text{m/s}}$$

Gives us

(6.625*10^-34)/(5.98*10^24)*(299792458) = 3.32128*10-50 m

So this means

$$m * (-\Psi(r,t))$$

Earth has a Black Hole Wavelength of 3.32128*10-50 m and there are 5.98*10^24 wave functions inside a radius of 4.4mm.

As more mass is added to the Black Hole, its radius will grow and all the mass will be turned into QM wave functions.

This is what the Theory indicates at the present time. I will not cover Black Holes evaporating in this section or emitting Hawking radiation as this will be a different section.

1.14 Schrödinger's Cat In Pi-Space

This was a thought experiment thought up by Einstein and Schrödinger. A cat is placed inside a box which has a 50/50 chance of survival (poison gas or an explosive material). The rules of Quantum Mechanics dictate that we can only know if the cat is alive/dead when the box is opened. There is also the more difficult question of who is observing the Observer and so on. It can go on forever. Using this approach, nothing happens until it's observed and it cascades.

Let's explain this experiment using the amended QM function, where there needs to be both a parent wave function and a child wave function to be observable. The parent wave function is the Gravity field and the atoms of the cat inside that field. Therefore the cat is already "observable" and we know its position.

$$\left(-\frac{\hbar^2}{2m}\nabla^2\Psi(r,t)+V(r)\Psi(r,t)\right)\left(m*\left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t)-\Psi(r,t)+\frac{gh}{c^2}\Psi(r,t)\right)\right)*$$

Therefore, even if the cat is not observed inside the box, it's sharing the same parent field as the Observer therefore we share the cat's state, so we don't need to open the box to produce the result. As someone in QM might say "both systems are entangled". Also, the Observer also does not need to be observed to exist in this situation as they have a parent and child wave function so they are both Observable.

If one just considers the child wave on its own, we only know the probability of the result, so this is the world of the cat where it is not bound to any parent wave function.

$$\left(-\frac{\hbar^2}{2m}\nabla^2\Psi(r,t)+V(r)\Psi(r,t)\right)\left(-\frac{\hbar^2}{2m}\nabla^2\Psi(r,t)+V(r)\Psi(r,t)\right)*$$

1.15 Local versus Non Local Quantum Events and Why Non Local Are Faster Than The Speed of Light

Einstein famously stated that nothing can travel faster than the speed of light. Let's describe how we model this in Pi-Space and then explain why some Quantum interactions happen instantly in our reality and are breaking this speed of light rule while others are not. To understand how this works, we need to understand the concept of Local versus Non-Local

Quantum events. Let's consider the parent child binding in Pi-Space and figure out the Local Component here and the Non-Local component.

$$\left(-\frac{\hbar^2}{2m}\nabla^2\Psi(r,t)+V(r)\Psi(r,t)\right)\left(m*\left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t)-\Psi(r,t)+\frac{gh}{c^2}\Psi(r,t)\right)\right)*$$

Let's focus on the Gravitational constant g which is part of the Gravitational Field. Newton showed us that in order to calculate this Gravity field value, we need to know the mass of all of the object or planet and the size of the radius of that object.

$$\frac{\left(\frac{GM}{r^2}\right)}{c^2}=\frac{g}{c^2}$$

This gives us a more complete formulation

$$\left(-\frac{\hbar^2}{2m}\nabla^2\Psi(r,t)+V(r)\Psi(r,t)\right)\left(m*\left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t)-\Psi(r,t)+\frac{\left(\frac{GM}{r^2}\right)h}{c^2}\Psi(r,t)\right)\right)*$$

Therefore we can see that the parent wave function producing the Gravity field needs to know all of the mass of the planet (for example) in order to produce the Gravitational constant g. When an atom is inside a planet, the Gravity field is always there. Therefore, the Generation of the parent Gravity field is done first. In Pi-Space we can model this as a parent wave function which is generated before the child wave function. *Therefore we state in Pi-Space that the generation of a Gravity field which can be modeled as a parent wave function is Non-Local*. What we mean by this is that it is generated before the child wave function. However, each wave function is constrained by speed of light C which is the fastest that each wave function can operate. I'll discuss C in more detail in another lecture. For now, let's just focus on Local and non-Local.

$$\left(-\frac{\hbar^2}{2m}\nabla^2\Psi(r,t)+V(r)\Psi(r,t)\right)^{Local}\left(m*\left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t)-\Psi(r,t)+\frac{\left(\frac{GM}{r^2}\right)h}{c^2}\Psi(r,t)\right)\right)^{NonLocal}*$$

So, what do we mean by "Local"? Imagine a car moving relative to you, or someone throwing a ball and you catching it, or a plane flying overhead making noise. It's our simple concept of cause and effect. We can measure the speed, distance and time of this cause and effect. This is "Local". All our child wave functions are "Local" because we're sharing the same parent wave function. We all have an upper limit in this Local space of C which just means that we shorten our wave function until it finally combines with our "Non Local" parent. Take for example the lecture on falling into a black hole. This is "Local" waves merging with the "Non Local" parent. The mass has dropped out of our reality and is bound to the non local parent. (See lecture on how I derived this.)

$$m * (-\Psi(r,t))^{NonLocal}$$

What’s so special about a non local parent? If you think about what happens to mass when it falls into a Black Hole, time apparently “stops” relative to us. What this means in Pi-Space is that the local wave functions have joined with the non local parent. The wave functions are still operating but they are no longer part of our local reality. However, the non local wave functions also have their own speed of light C which is just the maximum rate at which the wave function operates but we are not aware of it.

So here is the important rule of thumb of how a non local wave interacts with a local wave. This is a relativistic principle.

Updates to a non local wave function relative to local wave function will appear instantly within a local wave function because the non local wave is completed first. This will appear to violate speed of light C in the local wave function and consequently any reality created from it. From a relative perspective, speed of light C is broken for the Observer in the local wave function. Conversely, if a local wave tries to measure a non local wave, it will appear to have no time component relative to the local wave and therefore updates on the non Local wave will be instant relative to the local observer.

Therefore if we have local changes to non local field effect e.g. a magnetic or a gravity field effect, changes to it will appear instantly within our child frame of reference no matter their distance. This will appear to violate speed of light C constraint.

Also what this means is that if we try to find a Gravity wave or Graviton in our Local wave frame, we will not be able to find it. This is because the Gravity wave or Graviton is in a non Local wave property.

Therefore, it we want to travel large distances instantly relative to our local frame of reference, all we need to do is create experimental conditions where we merge with the parent wave function for the transport component and then drop back out returning to our local frame. The space jump will appear instant to our frame of reference. I’ll discuss details of this later.

All right, now we have established the concept of local and non-local waves. Let’s apply the idea to some well known experiments.

Neutrinos were recorded breaking the Speed of Light.

When a particle reaches the speed of light, what this means is that the local wave is becoming non-local. Therefore it binds with the parent wave which generates our gravity field. All interactions there are instant relative to our local frame of reference. Therefore, as the Neutrino moves inside the parent wave, which is a form of hyperspace and it will disappear from our reality or become “non local”. As it slows it returns to our reality. I’ve also explained while doing the classical piece that particle velocity is not constrained by the speed of light. This is built into the formulae. When a particle travels at C, its energy component is MC^2, not infinite. At this point, it becomes non local.

Quantum Entanglement of two Electrons where Spin Up/Spin Down is non-local

The two electrons are local. However one of the properties of the electron pair namely spin-up and spin-down is bound / entangled with the magnetic field which is non-local. Therefore when one electron is spin-up the other changes to spin-down instantly in the local frame of reference. However, what we do not see is that the non-local field propagates that update at C relative to itself. This is because non-local fields are fully generated before the non-local fields so we experience an instant update from a non-local field.

Creating a Jump Drive > C

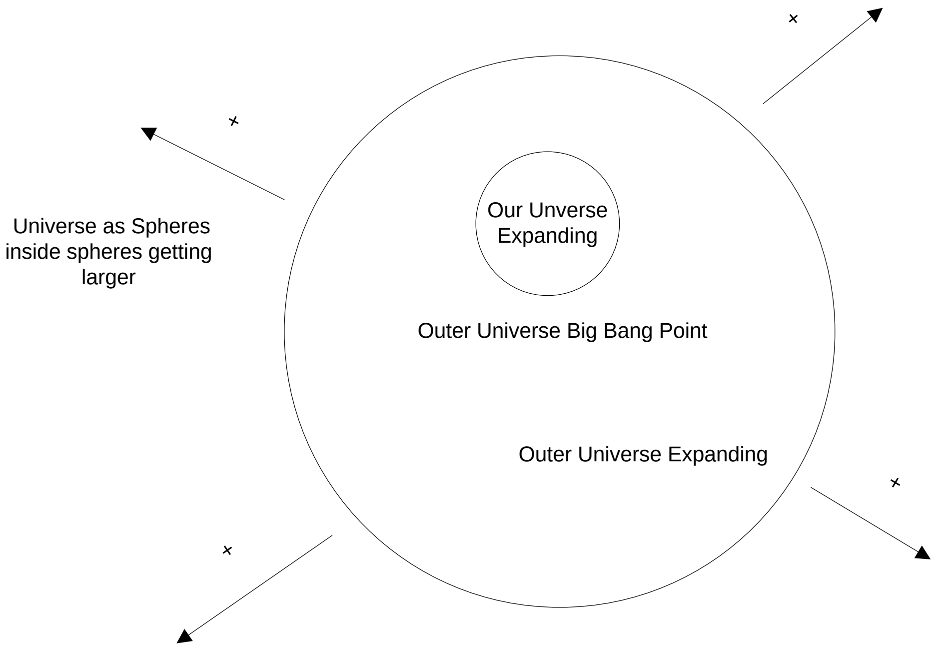
Compress the fields of an object such that their local waves become non-local. There are currently two known ways to do this which I am aware of. In the first case, use a particle accelerator. Field effects compress or shorten waves and the particle moves faster. Apply the field until the local wave becomes non-local similar to the Neutrino. Therefore the particle will appear to drop out of our reality and travel large distances in an instant. Alternatively, develop a technology which compresses mass waves similar to a black hole and fire the object into it until its waves become non-local. It would be beneficial if the jump drive is inside the object and when activated, it makes the ships' atoms non-local so it can sustain the jump, then deactivate to drop back to "local space". In theory, if UFOs exist this may be how they do this. Therefore one would find an engine in the center of the craft possibly implementing some kind of field compression technology. It could also be used as some kind of stealth technology by advanced species, if they exist.

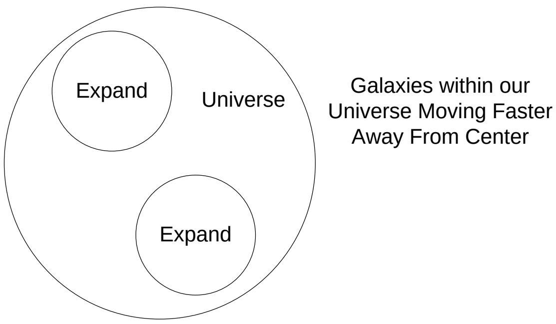
1.16 Dark Energy and an Expanding Universe

Let's explain how we can explain Dark Energy and an expanding universe which is constantly expanding, in some case faster than the speed of light. The general model of Pi-Space pertaining to our reality is that we are waves within wave within waves which form certain structures. This goes on forever and is a mathematical consequence of our reality. The waves are characterized by Euler's Identity and the Quantum Gravity formula I derive. Therefore, we can imagine our Universe as inside another Universe and so on. At the moment of creation of our Universe our mass formed atoms and generated Local waves which formed our atoms. This is our frame of reference. However, the Universe itself is characterized as a non Local wave inside another non Local wave which we can think of as an Outer Universe. Our Universe has mass m1 and the outer universe has mass m2. The can be another with mass m3 and so on. There is no upper limit.

$$\left(m1*\left(Cos\left(ArcSin\left(\frac{v1}{c}\right)\right)\Psi(r,t)-\Psi(r,t)+\frac{g1h}{c^2}\Psi(r,t)\right)\right)^{Universe}\left(m2*\left(Cos\left(ArcSin\left(\frac{v2}{c}\right)\right)\Psi(r,t)-\Psi(r,t)+\frac{g2h}{c^2}\Psi(r,t)\right)\right)^{OuterUniverse}*$$

The expansion of the Universe itself is seen in Pi-Space as one sphere inside another increasing one. As our Universe moves outward, it gains Potential Energy which just means that it's getting larger. Inside we have m1 which is theoretically our Universe and it's expanding. The galaxies which have formed move further apart and space and time are expanded. In Pi-Space all this means is that the atoms are getting larger, longer clock tick but distance is also getting larger so we don't notice it. However, if we look at the distant galaxies we'll see that they are moving away from us faster because Pi-Space stretching is linearly proportional to area change but non-linear with respect to vector distance. Also, it'll be possible to see Universes in the "Outer Universe" which move away from us greater than the speed of light. This just means they are from the non-Local Outer Universe where updates can happen in our Local space > C as I've discussed before. If the idea is correct, then the distance with respect to acceleration from the center of our Universe can be calculated as a function of 1/r^2 where r is the distance from the center of our Universe. There's no dark matter "particle" as such causing it. In this theory, it won't be found. It's a product of the wave function interaction.





Over time we will appear to accelerate further apart but this is because our curved space is getting larger.

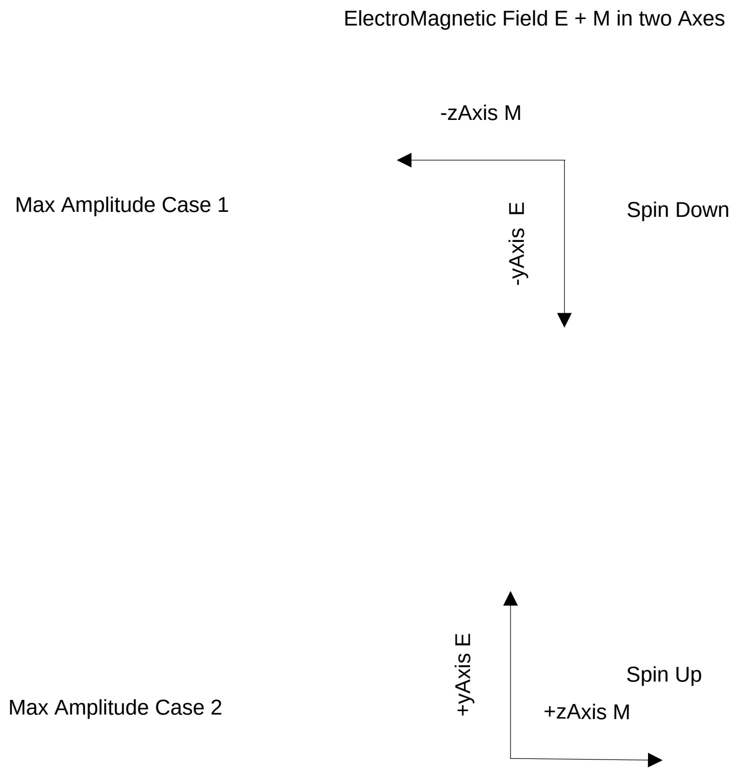
Final thought. Oh, and the reason why galaxy clusters are not torn apart by this expansion is because they theoretically lie parallel to curved space time as opposed to perpendicular to it. This would have to be confirmed by Cosmologists.

1.17 Orthogonal Waves Producing a Gravity Field and the EM Case

Let's explain how we can produce a Gravity field and a linear vector space using the Quantum Gravity formula. We will model this on the EM field arrangement proposed by Maxwell and it is well accepted so this is a good approach to take.

In the Maxwell model, we have an Electric and a Magnetic Wave. Both are in synch with one another but on orthogonal planes. We imagine the Electric field in the vertical plane and the magnetic field in the horizontal plane.

The consequence of this is that we end up with two unique maximum amplitude solutions which combine two axes.



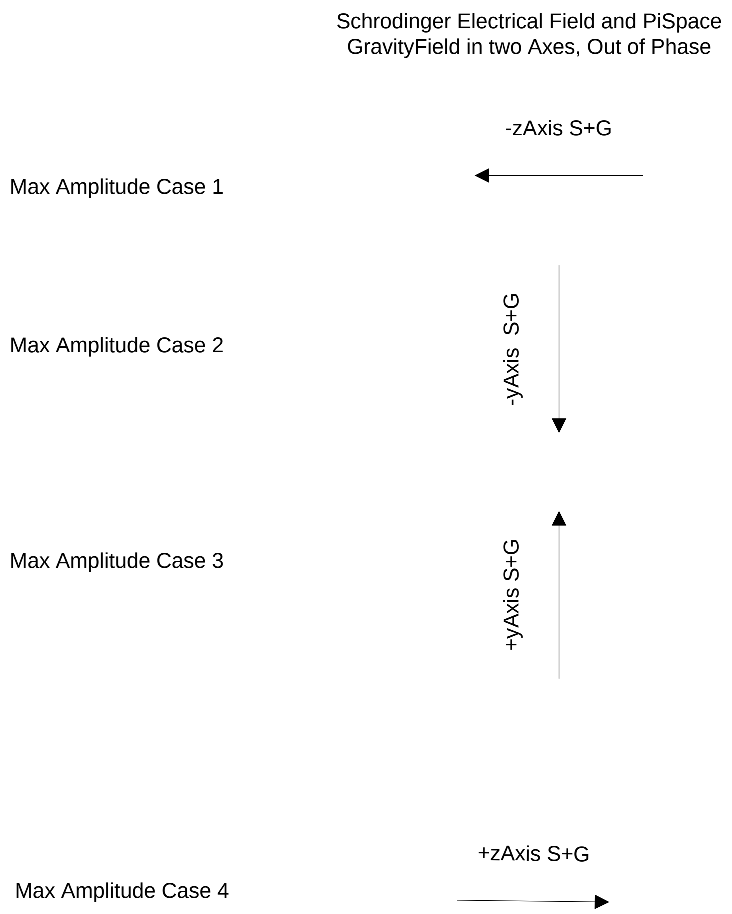
This produces two unique solutions which cover two distinct axes. From this we produce the idea of positive and negative charge for the electrical piece. We also then have the idea of a magnet having a Dipole for the magnetic piece. The field lines for North and South are essentially reorienting these orthogonal axes to the other solution. I will provide more detail on this later. The basic point is that we have a single point solution having to consider two axes which was the conclusion Maxwell came up with and is the accepted solution.

So how can we use this approach with two fields, one for Schrödinger and one for Gravity, and get the solution we already know which is a three-dimensional linear space with no charge? The proposed Pi-Space Quantum Gravity formula is.

$$\left(-\frac{\hbar^2}{2m}\nabla^2\Psi(r,t)+V(r)\Psi(r,t)\right)^{Local}\left(m*\left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t)-\Psi(r,t)+\frac{\left(\frac{GM}{r^2}\right)h}{c^2}\Psi(r,t)\right)\right)^{NonLocal} \quad *$$

Both axes are already orthogonal so we are half-way there. However, we don't expect a solution where we get two axes like Maxwell EM. The answer is to place the Non Local field **out of phase** with the local field. In other words, we have the Euler's Identity in two axes where we have a Sin wave in one and a Cos wave in another.

The maximum amplitude solution to this is as follows.



Therefore the solution is a vector space which is three-dimensional which matches the Classical view of Gravity and also the Einstein relativistic one. There is only one vector space so we do not need the idea of "charge" for a particle as they are all the same. Also, we do not have a second Axes, so we do not have an equivalent magnetic component or the need for a Dipole. This is achieved by simply having the same wave solution as EM but placing the Gravity wave function out of phase with the Schrödinger wave function.

1.18 Modeling E + M + G

Magnetic wave / field and Gravity wave /field interact with the Electric wave / field

E+M is in phase produces orthogonal field space (E +-charge and M dipole / moment)
E+G is out of phase produces 3 dimensions + time + Relativity (atoms of varying sizes + non local G field)

E is modeled on Schrodinger wave equation
G is modeled on Pi-Space Quantum Gravity equation
M is modeled on Maxwell with potentials. I'll define this next.

1.19 Understanding Magnetism

EM Magnetic field is produced only when there is relative movement within the proposed Pi-Space Gravity wave plane; recall I proposed that the Magnetic Field is in the same plane as the Magnetic Field but out of phase.

Formally, Lorentz force is defined as

$F = q(E+v \times B)$

Note how the velocity v of the particle and magnetic B are entangled. However, they are both on two separate planes.

Therefore one can conclude using current approach that a Magnetic Field is produced only when there movement within the Pi-Space Gravity wave function.

So the relativistic version of it would appear something like, for Gravity wave (Out of Phase with E) and Magnetic Plane (In Phase with E)

Pi-Space Gravity Wave (planet wave) + Magnetic Wave (movement relative to planet) = Total Wave on Plane, similar to Cos + Sin in Trig...

Interestingly, this brings my work starting on Special Relativity "full circle", no pun intended. This was the reason why Einstein started his work on Special Relativity. The issue of magnetic fields appearing only due to movement intrigued him. Together, he and Dutch Physicist Hendrik Lorentz did the majority of the ground breaking work on this issue of how to represent a similar idea for non-EM based particles. This was of course, mainly based off the original work by Maxwell in the UK previously. Recall that Irish Physicist George Fitzgerald also helped do the original work on the Lorentz-Fitzgerald transformation.

1.20 Kinetic Energy = Potential Energy for a Magnetic Field In Pi-Space

We model the movement on a charge in a circular magnetic field and from this we solve for PE and KE.

Particle Accelerator BQv = mv^2/r

mv = BQr

Assume mass is the same as charge Q (because the electric potential uses Q in place of mass)

B is the acceleration like g

r is the position like h

so it's like mgh = QBr = Potential Energy mv is the v=Vf final velocity and we want 0..v.

so we get

PE = KE

QBr/c^2 = m*(1-Cos(ArcSin(v/c))

This is what I will use for the Quantized Magnetic field. The idea is that we break out the Magnetic piece and the Velocity piece into two different planes. The Magnetic component is non-Local and on the same plane as the Gravity wave. The relativistic particle (bigger / smaller) is on the same plane as the Electric / Schodinger wave.

1.21 Quantum Magnetic Wave Solution in Pi-Space

Previously for a charge in a particle accelerator

$$BQv = m * \frac{v^2}{r}$$

The Magnetic Field causes an area change (aka Newtons of force) of the particle like a Gravity field and the velocity is the diameter line of the particle. Therefore the Magnetic Field maps to Potential Energy and the Velocity maps to Kinetic Energy.

$$BQr = m * v$$

The velocity is the final velocity vf and we want KE for 0..Vf on the local plane.

Energy has units c^2 and velocity has units 1/c

I showed that for PE=KE

$$\frac{QBr}{c^2} = m * \left(1 - Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\right)$$

Hamiltonian H = PE + KE

KE shortens the wavelength so

$$Hamiltonian = \frac{QBr}{c^2} - m*\left(1 - Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\right)$$

Applying the Schrodinger wave approach for a charged particle we get

$$\left(-\frac{\hbar^2}{2m}\nabla^2\Psi(r,t) + V(r)\Psi(r,t)\right)^{Local}\left(\frac{QBr}{c^2}\Psi(r,t) - m*\left(1 - Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\right)\Psi(r,t)\right)^{NonLocal} *$$

This is the EM electrical and magnetic solution for a point charge in a magnetic field.

$$\left(-\frac{\hbar^2}{2m}\nabla^2\Psi(r,t) + V(r)\Psi(r,t)\right)^{Local}\left(Q\frac{Br}{c^2}\Psi(r,t) - m*\Psi(r,t) + m*Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t)\right)^{NonLocal} *$$

1.22 General Table Solution for E + M + G

The high level general solution for combining E + M + G in Pi-Space is as follows.

We extend the Maxwell E+M orthogonal wave solution to add two additional waves, one per orthogonal plane.

The two waves are out of phase with the E + M waves.

We add the already defined Field Gravity wave as bound to the Magnetic plane. It turns out that the Magnetic field is a disturbance in the Gravity wave due to either relative movement or the presence of mass or charge. More detail to follow later.

We add another wave to the Electrical wave plane which is out of phase with respect to it. This wave is the relativistic Particle Gravity wave due to Local movement of a particle and causes Special Relativity to particles as outlined in Einstein’s SR work and extended in SR Pi-Space.

Note that in the Pi-Space Theory non charged particles also have a field effect similar to magnetic fields as a theoretical consequence of this. This is therefore the reason for turbulence in liquids (around plane wings, in water etc;). There is currently no known theory for this at present and are seen typically as perpendicular to movement like a magnetic field. In the Pi-Space theory it is claimed that Turbulence is the relativistic consequence of motion of Particle and Field Gravity waves on two orthogonal planes which are out of phase with the EM wave. This is the same idea as the Magnetic field being a relativistic field due to movement. Turbulence is therefore a relativistic effect also. More detail to follow on this.

The maximum amplitudes of the two planes combine to form the diameter of an Observable particle, thus solving the Measurement Problem in Quantum Mechanics. Potential energy makes the diameter larger. Kinetic Energy makes the diameter smaller as already shown.

The Local waves travel at Maximum speed of light. The non Local waves will appear typically as large exterior fields and will be generated instantly relative to us, explaining

Quantum entanglement as explained earlier where the results are instant. Detail on non-local waves has already been described. The Electric plane is Local. The Magnetic plane is non Local. Also, a non Local wave will not be detectable from a Local wave but the effect of that wave will realized on the Local plane.

Also, this theory also shows that the probability based approach used in QM currently works because it is only considering one of the wave function's maximum amplitudes in one plane. In the Pi-Space Theory one models all the wave functions to predict the position and location of an Observable which is a more classical approach.

Also, Pi-Space E+M+G solution fits in with the M-Theory, String Theory idea of tiny vibrations because the general design model is one of "waves within waves". What this means is that there is an infinite number of non-Local waves which have smaller and smaller wavelengths which can be modeled as vibrations. There is no detailed treatment of this in Pi-Space. The Branes can be seen as field effects. Pi-Space makes no comment currently on the Many Worlds solution as proposed by M-Theory one way or the other.

Therefore, there are two types of distinct behaviors; along the plane and across the plane.

Therefore, we can bring all these ideas together into the following table.

Wave	Phase	Plane	Behavior	Local / Non Local
Schrödinger wave	In Phase with Magnetic wave Out of Phase with Particle Gravity wave	Maxwell Electric Plane	Electron, part of EM wave, Electricity, Power Electric Field	Local
Magnetic wave	In Phase with Electric wave Our of Phase with the Field Gravity wave	Maxwell Magnetic Plane	EM wave Maxwell, Magnets, Power, Generators Magnetic Field	Non Local
Field Gravity wave	In phase with the Particle Gravity wave Out of phase with Maxwell Magnetic Wave	Maxwell Magnetic Plane	Newton Gravity Einstein GR Gravity field *Also particle movement relative to this Field Gravity wave produces*	Non Local

			Turbulence in water Around plane wings Field effect Orthogonal to movement	
Particle Gravity wave	In phase with the Field Gravity wave Out of phase with Maxwell Magnetic Plane	Maxwell Electric Plane	Special Relativity Einstein Louis De Broglie wavelength	Local

1.23 Simple Proof Explaining Reason For Existence of Turbulence and Vortices in Non Charged Mass

In Pi-Space, we model the Gravity field as an extension of the Maxwell solution for electromagnetism. The Gravity wave is a Quantized wave function which is out of phase with the Magnetic Field but on the same plane. We define the Gravity Quantized wave function as follows.

$$\left(m*\left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t)-\Psi(r,t)+\frac{gh}{c^2}\Psi(r,t)\right)\right)$$

We also derive a Quantized Magnetic field as follows, based on a charged particle in a Magnetic field with strength B.

$$\left(m*\left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t)-\Psi(r,t)\right)+Q\frac{Br}{c^2}\Psi(r,t)\right)$$

The Quantized formula explains how movement produces a circular movement in the orthogonal axis, shown by Lorentz' Law.

Note how the Quantized Gravity field is the same except that we are dealing with a Gravitational potential.

The strength of the disturbance on the Gravitational field however is much less than the Electric Field in relation to velocity v. In the case of the magnetic field we have charge Q and for a Gravitational field we have mass m.

Consider Maxwell's relation for an EM field in relation to the Electric and Magnetic plane.

$$c^2 = \frac{1}{\varepsilon^0 \mu_0}$$

Coulomb's constant is

$$\frac{1}{4\pi\varepsilon^0 \mu_0}$$

This produces a value of 9*10^9 N

Compare this to the value of the Gravitational constant which is 6.67300 × 10^-11 N

Let's apply the same analysis as EM where there is an electric constant and a magnetic constant where we assume there is a Gravitational "Turbulence" field effect constant on the magnetic plane (but out of phase) which creates a force. Maxwell typically called this a "disturbance" of the "ether" which is the Gravitational field disturbance with respect to velocity and mass in this case. Let's call this new constant tau.

$$c^2 = \frac{G}{\tau_0}$$

Therefore

$$\tau_0 = \frac{G}{c^2}$$

Versus EM

$$\mu_0 = \frac{k}{c^2}$$

Therefore we see that the disturbance to the Gravity field in relation to velocity is much less than that of the case of a Magnetic Field.

Also note that the Turbulence will be orthogonal and one must also model the Quantized Gravity wave function for the situation. Typically, in a continuous medium like a Fluid (air or water) the effect will be the most pronounced because the wave function can be modeled through the whole medium. In a pipe however, the boundary of the pipe itself will prevent the wave function to spread outside the confines of the pipe similar to Quantum Mechanical wave function modeling in a box.

Take for example the air around a plane wing achieving a relatively high velocity. Smoke can highlight this field effect for example.

As a consequence of this, studies of this turbulence / vortices effect should find that it closely resembles the behavior of a magnetic field except that the force is much less pronounced due to the Gravitational constant.

1.24 Faraday's Law

Let understand Faraday's Law as described in Pi-Space. At its simplest Maxwell showed the law explains the relationship between an Electric field and a changing Magnetic Field or the Magnetic Flux Density.

$$\nabla x E = -\frac{\partial B}{\partial t}$$

So we can move either the Magnet or change the Electric Field.

Also, Lorentz further defined the force aspect as

$$EMF = \oint (E + vxB) dlN$$

The first point to make about these well established formulas is that we are describing the two orthogonal planes and how they interact with one another and how a change in one affects the other.

Let's go back to first principles and describe these formulas in Pi-Space

An electromagnetic particle is described by

$$Energy = \pi d \wedge 2$$

Where

$$d = diameter$$

And amplitude of the wave maps to the diameter

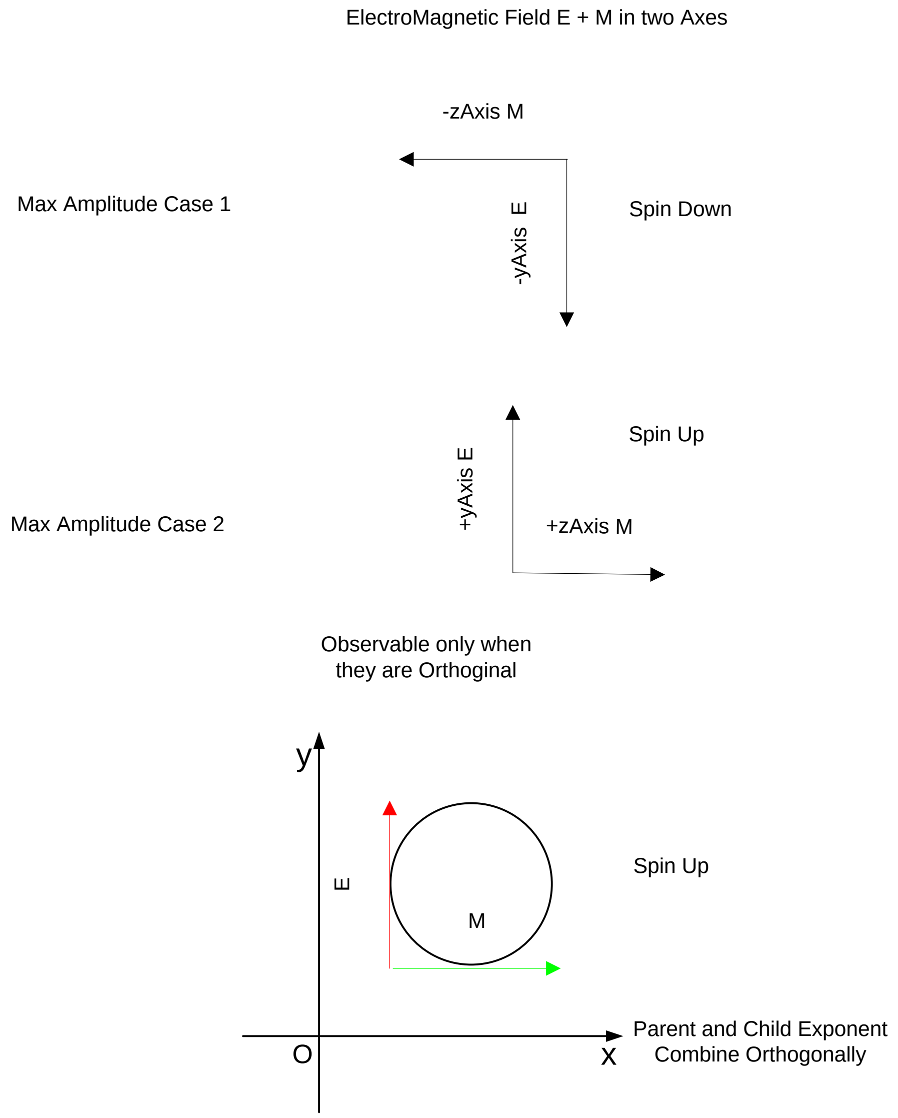
$$diameter = amplitude$$

We have two Maxwell orthogonal planes for an EM particle, the Electric and the Magnetic which have max amplitudes which form the diameter of the particle.

Therefore we get

$$Energy = \pi(magnetic * electric)^2$$

Both Maxwell plane amplitudes combine to form an EM particle. There are two cases as I've shown before Spin Up and Spin Down.



X and Y axes are notional.

Therefore the Magnetic and the Electric Plane are bound to one another to make a Particle in terms of its diameter.

Therefore changing one can affect the other; either the electric plane or the magnetic plane.

In the Pi-Space Theory as shown for Special Relativity, movement with velocity v is seen as the shortening of a diameter with respect to an observer. If you're unclear on this please read the Introduction to Pi-Space Theory where this is explained in detail.

Therefore in this case, we can either shorten the diameter of the Magnetic Plane making up the Observable or the electric plane diameter.

Also because the two planes are bound to one another a change in the Electric Plane causes a change in the Magnetic Plane.

Maxwell showed us the relationship between the planes. Each plane makes up the diameter of the EM particle. Therefore each plane has a maximum speed of light C. Units are 1/c. So we have the electric and the magnetic plane affected by different forces on that plane.

Maxwell showed us.

$$c^2 = \frac{1}{\varepsilon^0 \mu_0}$$

Let's look at each plane separately.

The electric plane ratio to the Electric Field change of 1/c is.

$$\varepsilon^0 = \frac{1}{c}$$

The magnetic plane ratio to the Magnetic Field B change of 1/c is.

$$\mu_0 = \frac{1}{c}$$

And if we consider Pi*d^2=Pi*(magnetic plane * electric plane) we get the Maxwell result

$$\varepsilon^0 \mu_0 = \frac{1}{c^2}$$

So this idea is consistent with the Maxwell's work.

Let's understand force next, as defined by Lorentz.

There is force on the Electric Plane and on the Magnetic Plane.

In Pi-Space force is defined in units of area 1/c^2.

For an electric plane, force means an area loss to the EM particle (in Newtons). This is defined by Lorentz as.

$$EMF = \oint (E) dlN$$

For the Magnetic plane, force is a combination of the changing magnetic flux and velocity v. Magnetic Flux is defined in units Teslas which are 1/c^2 area units (Newtons) and velocity units are 1/c which is a diameter change. We use the cross-product to multiply these forces on the same plane and then map them to Electric Plane which is orthogonal. Therefore we use the cross product as a mechanism to map force from one plane to another (Magnetic to Electric).

$$EMF = \oint (vxB) dlN$$

Finally we combine these two effects to get Lorentz formulation which means an area change in Pi-Space.

$$EMF = \oint (E + vxB) dlN$$

The force / area change is in the direction of the Electric Plane which is part of the EM particle.

What is missing from these formulas is calling out what diameter based movement means in terms of the component interactions.

In Pi-Space, Faraday's Law shows specific examples of the *general rule* of how the shortening of the diameter of an Observable particle leads to movement relative to an observer's diameter. This rule applies to both an EM particle and a non charged particle. Therefore Einstein's SR is dealing with diameter shortening due to movement when it is interpreted in Pi-Space.

On each plane there are two distinct types of effects which can alter the diameter d of the particle defined by Pi*d^2.

1. Particle-Particle caused diameter change e.g. movement by hand, collisions
2. Particle-Field caused diameter change e.g. particle inside or near electric / magnetic / gravity field

Therefore, we can do different types of Particle-Particle movement

1. Move the magnet
2. Move the wire
3. Move the electrons through the wire AKA current I

Also there are different types of Particle-Field movement

1. Change/move the magnetic flux
2. Change/move the electrical field

All of these actions change the diameter of the Observable particle. This is why movement in one plane causes movement in another plane.

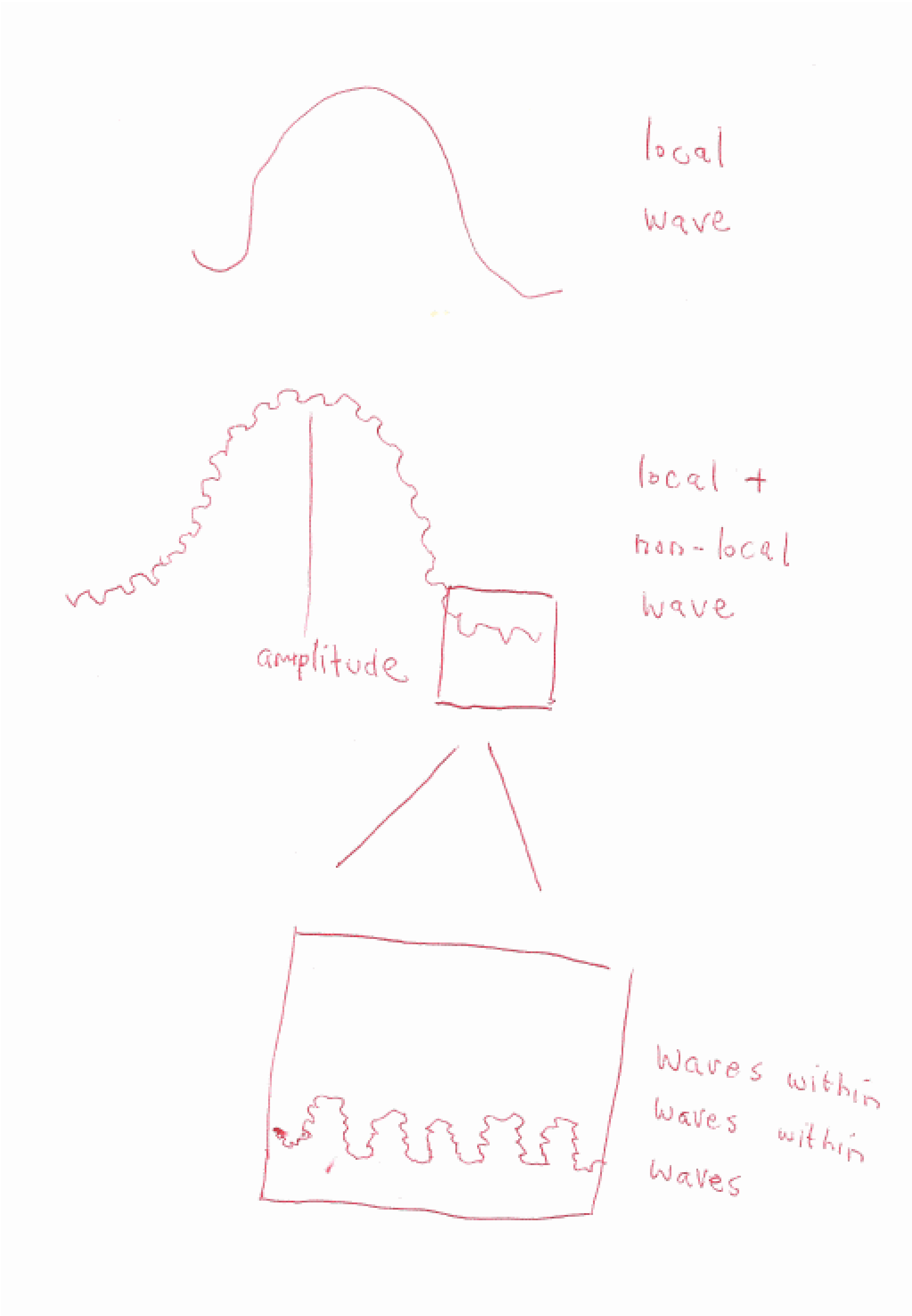
From the equations, we can see that movement affects the Magnetic Plane and both planes are bound to one another. Ampere's Circuital Law with Maxwell modification.

$$\nabla x B = \mu_0 J + \varepsilon^0 \mu_0 \frac{\partial \phi s E}{\partial t}$$

1.25 Drawing Local and Non-Local waves

Let's draw what a wave within a wave looks like or what I call Local and Non-Local waves. The Gravity and Magnetic Fields are non-Local. Movement within these fields is local. They Gravity and Magnetic fields have shorter wavelength. Larger local waves move within this and are larger and their diameters ultimately form what we call Observables or what I call Pi-Shells. Note, that the pattern goes infinitely smaller and infinitely larger. In Pi-Space there is no theoretical upper or lower limit. To a certain extent, this is how Pi-Space fits in with Chaos Theory where these waves can be seen as a form of Chaos Theory function producing a distinct repeating pattern.

For now, I have hand drawn this. Later, I may have a better drawing maybe via some Java code. I am unaware of any Visio tools that will do this at present but I think it's important to show the concept in a drawn fashion.



This can be represented by one Sin wave added to another for example. I will describe this in more detail later.

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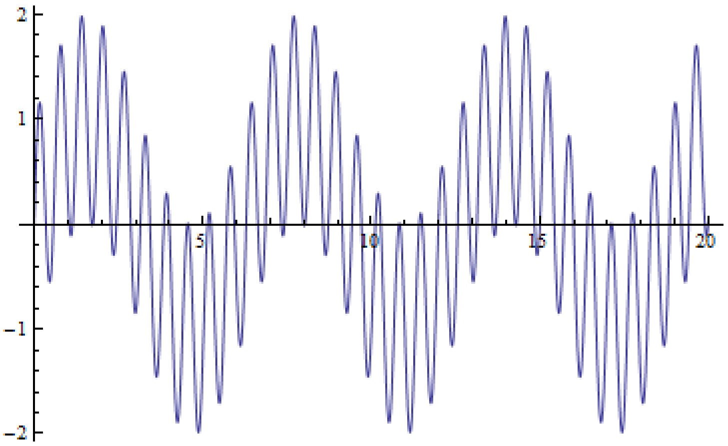
Out[18]=



1.26 Defining The Local Plane And Bernoulli

So far, I have not described in detail the Local plane for non charged mass. This equation is pretty much there already and used all the time. I will derive the Quantum version of it. However, let's first understand what it means to model the Local plane. On this plane, we deal with the atoms and particles which collide with one another and move. On the other non-local plane, we have the Gravity field and the associated potential. Therefore, it we want to take into account both planes, we need to handle all of this.

Bernoulli defined this as follows

$$\frac{v^2}{2} + gz + \frac{p}{\rho} = const$$

Or

$$\rho \frac{v^2}{2} + \rho gz + p = const$$

Where we combine kinetic and potential and pressure, which is Force with respect to area and maps to an area change / loss of a particle.

In Pi-Space, we interpret this as

Local Field (Pressure) + Non Local Field effect (Gravity) = constant

Note: Both planes support KE which is just velocity based movement.

This is essentially an energy conservation law.

Already, for the non-Local plane, I've derived

$$\left(-\frac{\hbar^2}{2m}\nabla^2\Psi(r,t)+V(r)\Psi(r,t)\right)^{Local}\left(m*\left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t)-\Psi(r,t)+\frac{\left(\frac{GM}{r^2}\right)h}{c^2}\Psi(r,t)\right)\right)^{NonLocal} \quad *$$

This is how a Gravity field interacts with a charged electrical particle.

Let's do the Local non-charged piece next, modeling Bernoulli. Larger Pressure means a larger diameter so it's a plus.

$$\left(m*\left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t)-\Psi(r,t)\right)+\frac{\left(\frac{p}{\rho}\right)}{c^2}\Psi(r,t)\right)^{Local}$$

This produces the Local, non-Local mappings for non-charged mass. For example, this models the flow of a flow of a liquid. I'll cover the issue of turbulence after this and temperature as well and how it fits in.

$$\left(m*\left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t)-\Psi(r,t)\right)+\frac{\left(\frac{p}{\rho}\right)}{c^2}\Psi(r,t)\right)^{Local}\left(m*\left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t)-\Psi(r,t)+\frac{\left(\frac{GM}{r^2}\right)h}{c^2}\Psi(r,t)\right)\right)^{NonLocal} \quad *$$

So far, I have not mentioned Einstein's General Relativity. At this point, one can now start bringing in the Einstein's idea of The Equivalence Principle. Each plane affects the other. This is what the Einstein Field Equation models. Therefore this formula is analogous to the Einstein Field Equation, in case one is wondering. On one side we have the particle and on the other side we have the field. Both are essentially bound to each other. The refinement that Pi-Space offers is orthogonal axes binding to form the diameter of a Quantum particle but the idea or modeling is essentially the same.   I'll cover this later but I think it's instructive to add it here to see how it fits in with Pi-Space Quantum Gravity.

Einstein's EFE is

$$R\mu\nu-\frac{1}{2}g_{\mu\nu}R+g_{\mu\nu}\Lambda=\frac{8\pi G}{c^4}T_{\mu\nu}$$

Basically, one the left hand side we have the field and on the right hand side we have the particle as a Stress Energy Tensor. The Pi-Space Gravity formula is quantized so they approximate one another.

$$R\mu\nu - \frac{1}{2}g_{\mu\nu}R + g_{\mu\nu}\Lambda \approx \left(m * \left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t) - \Psi(r,t) + \frac{\left(\frac{GM}{r^2}\right)h}{c^2}\Psi(r,t) \right)\right)^{NonLocal}$$

And, we have pressure on the particle which is also expressed in the Stress Energy Tensor so they also approximate.

$$\frac{8\pi G}{c^4}T_{\mu\nu} \approx \left(m * \left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t) - \Psi(r,t) \right) + \frac{\left(\frac{p}{\rho}\right)}{c^2}\Psi(r,t) \right)^{Local}$$

I'll cover this in more detail later but conceptually this is enough for now.

1.27 Reynolds' Number And The Spread of the Non Local Wave Function

Turbulence and vortices appear when fluids or liquids move relative to some surface. Osborne Reynolds studied the effect and derived a formula to calculate a number to represents laminar flow versus turbulent flow.

$$\mathrm{Re} = \frac{\rho v L}{\mu}$$

This is a dimensionless (scaling) value. However, if we multiply this by

$$\frac{vL}{vL}$$

Gives us

$$\frac{\rho v^2 L}{vL\mu} = \frac{inertiaForce(Drag)}{viscousForce}$$

Therefore Turbulence is a Pi-Shell area change on a plane. Pi-Space extends this description by talking about the spread of a wave function which produces Turbulence and vortices.

Let's explain this in more detail in Pi-Space.

In Pi-Space, we model turbulence as a disturbance of the Gravity field on the non local plane, similar to a Magnetic field. So therefore, the vortices field lies in the same non local plane and will be orthogonal to movement and circular.

$$\left(m*\left(Cos\left(ArcSin\left(\frac{v}{c} \right) \right)\Psi(r,t) - \Psi(r,t) \right) + \frac{\left(\frac{p}{\rho} \right)}{c^2}\Psi(r,t) \right)^{Local} \left(m*\left(Cos\left(ArcSin\left(\frac{v}{c} \right) \right)\Psi(r,t) - \Psi(r,t) + \frac{\left(\frac{GM}{r^2} \right)h}{c^2}\Psi(r,t) \right) \right)^{NonLocal} *$$

In the case of Turbulence, we are dealing with the non local plane for the field effect. However, the viscosity is on the local plane which relates to the turbulence on the non local plane. Let's consider the local plane where the viscosity is and calculate its effect on the vortex.

$$\left(m*\left(Cos\left(ArcSin\left(\frac{v}{c} \right) \right)\Psi(r,t) - \Psi(r,t) \right) + \frac{\left(\frac{p}{\rho} \right)}{c^2}\Psi(r,t) \right)^{Local}$$

So far in the Theory, we have not defined the wave function in detail and how to calculate it. Reynolds helps us calculate this in practical cases.

In Pi-Space, we model the Quantum Wave function similar to a wave in a box, where the edges of the box, restrict the spread of the wave function. However, there can be quantum tunneling but the majority of the wave is kept inside the box, in this case. Let's consider the Turbulence wave function on the local plane.

$$TurbulenceWaveFn = \Psi(r,t)^{Local}$$

This is what the Reynolds' number is calculating for the object in question. Therefore, they are proportional to one another.

$$\mathrm{Re} \propto \Psi(r,t)^{Local}$$

Let's consider movement in a circular pipe. We need to calculate the spread of this wave function in the pipe. It is restricted to the size and shape of the pipe.

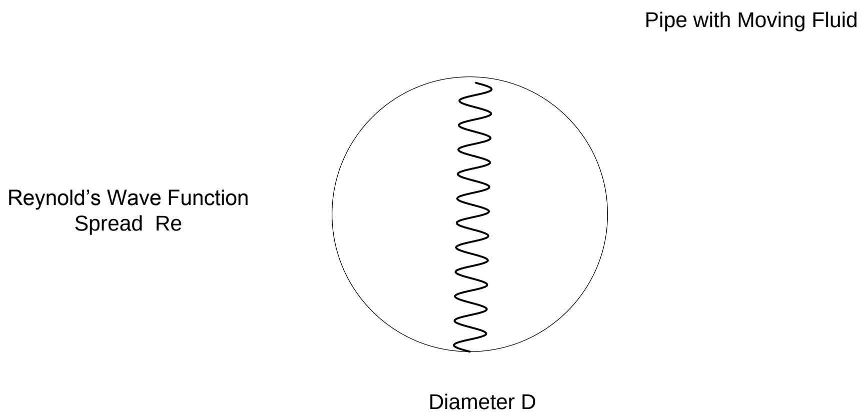
$$\mathrm{Re} = \frac{\rho v D_H}{\mu}$$

Dh = Hydraulic Diameter = Spread of the wave function over / inside surface

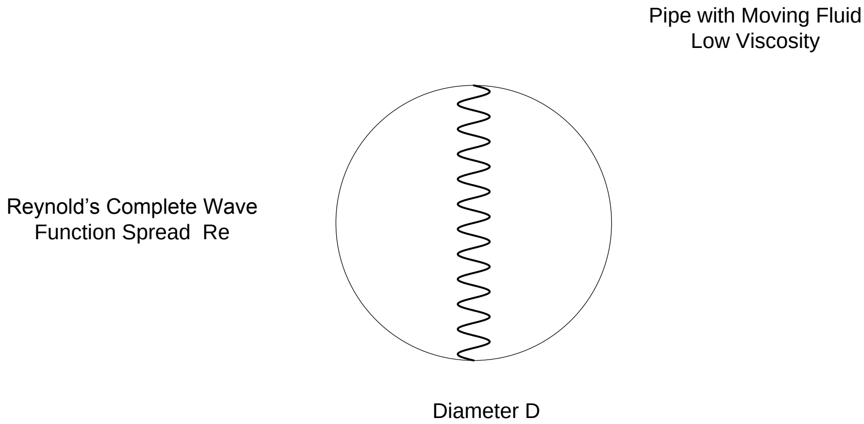
$$D_H = \frac{4A}{P} = \frac{4\frac{\pi D^2}{4}}{\pi D} = D$$

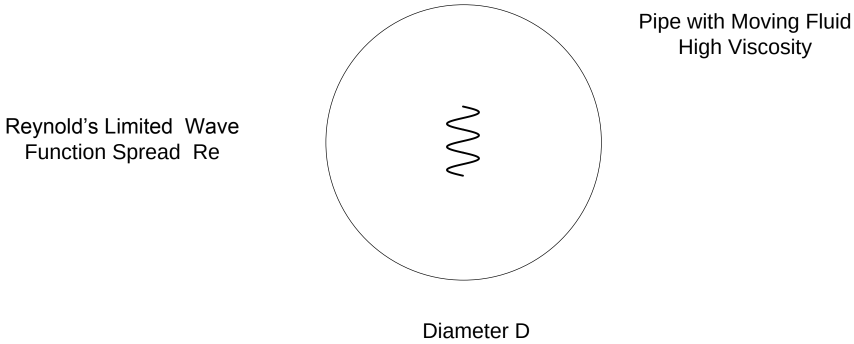
This is actually Pi-Space we divide the area of the Sphere by its diameter and we get the diameter for this geometric shape.

For this example, we can see that the spread of the turbulence wave function is along the diameter of the pipe. The greater the velocity, the stronger the turbulence produced by this wave. There comes a point where the flow becomes non Laminar.



However, the wave function spread due to movement is limited by the viscosity of the liquid.





Therefore, the Reynolds' number is calculating the total spread of the wave and the factors which limit the spread of the wave function, in particular viscosity.

So let's fit the Reynolds' Number into the Pi-Space Equation

$$\left(m * \left(Cos\left(ArcSin\left(\frac{v}{c} \right) \right) \Psi(r,t) - \Psi(r,t) \right) + \frac{\left(\frac{p}{\rho} \right)}{c^2} \Psi(r,t) \right)^{Local}$$

And we know

$$\mathrm{Re} = \frac{\rho v D_H}{\mu}$$

We already have mass m for density and velocity v. However, the Pi-Space function does not have the Reynolds' number. It limits the wave function and consequence area change. This gives us.

$$\left(m * \frac{1}{R_e} \left(Cos\left(ArcSin\left(\frac{v}{c} \right) \right) \Psi(r,t) - \Psi(r,t) \right) + \frac{\left(\frac{p}{\rho} \right)}{c^2} \Psi(r,t) \right)^{Local}$$

Which is analogous to

$$\frac{\rho v^2 L}{vL\mu} = \frac{inertiaForce(Drag)}{viscousForce}$$

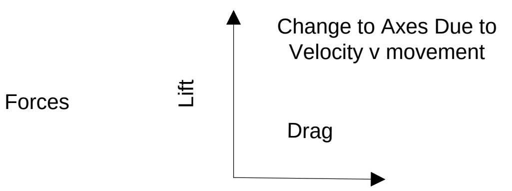
This is a rough approximation of how the Reynolds number fits in with the Pi-Space formula. The Navier Stokes work later covers a more detailed handling of this. It is a scaling value for the Quantum wave function and operates on the spread of the wave function. Note velocity squared is an energy calculation in the Classic Formula and the Pi-Space formula works on relativistic area.

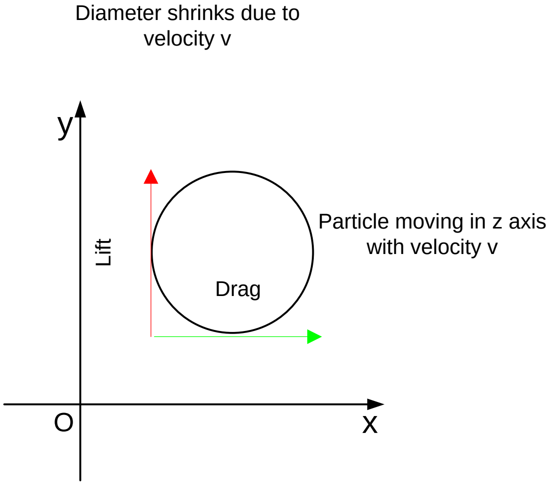
However, this is not the whole picture, we need to factor in Lift and Drag formulas next and explain how they fit into the Pi-Space orthogonal planes. I will talk about aero-dynamic lift where the wave function spreads along the plane wing and it is outside a surface as opposed to inside like water in a pipe. I'll also explain drag a little more.

1.28 Lift and Drag

In the Pi-Space Theory, we model a particle having two orthogonal wave functions which make up the diameter of that particle. Movement to that particle (charged or not) causes a change to those orthogonal axes. When a plane takes off, it moves through the air. The air particles around the wing move with velocity v. The movement of those particles causes changes to both orthogonal axes. One axis is responsible for lift and the other is responsible for drag. Lift occurs for specific cases when certain geometric shapes such as a plane wing interacts with moving air. I'll cover this in more detail in the Bernoulli Section where I explain how velocity produces low pressure.

Aerodynamic Forces modelled by Lift and Drag





Formally, we model the two axes as follows.

$$\left(m*\left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t)-\Psi(r,t)\right)+\frac{\left(\frac{p}{\rho}\right)}{c^2}\Psi(r,t)\right)^{Local}\left(m*\left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t)-\Psi(r,t)+\frac{\left(\frac{GM}{r^2}\right)h}{c^2}\Psi(r,t)\right)\right)^{NonLocal} *$$

Lift occurs on the local plane where the air particles exist and there is air pressure.

$$LiftForceOnPlane = \left(m*\left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t)-\Psi(r,t)\right)+\frac{\left(\frac{p}{\rho}\right)}{c^2}\Psi(r,t)\right)^{Local}$$

Drag occurs on the non-local plane where the Gravity field contributes to that orthogonal axis

$$DragForceOnPlane = \left(m*\left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t)-\Psi(r,t)+\frac{\left(\frac{GM}{r^2}\right)h}{c^2}\Psi(r,t)\right)\right)^{NonLocal}$$

Now both of these formulas represent force which is an area change of a particle.

We already have through aerodynamic studies, formulas for the force of lift and drag, factoring in the elements which contribute to lift and drag in terms of the shapes of moving objects and so forth.

$$ForceDrag = \frac{1}{2}\rho v^2 C_D A$$

So we have density, velocity, Coefficient of Drag and the orthogonal area of the moving object in question.

Now, as I have already pointed out, we are dealing with two orthogonal axes which form an observable. Therefore, the elements causing both lift and drag should have a similar formulation but just alter the different orthogonal axes by different amounts, right? Next, we see that this is the case, the Force Lift formula is almost the same as the drag except for the co-efficient used.

$$ForceLift = \frac{1}{2}\rho v^2 C_L A$$

In this case, the coefficient is called the Lift Co-efficient. Let's retrofit these into the Pi-Space equation.

$$AeroDynLiftForceOnPlane = \left(m * \left(Cos\left(ArcSin\left(\frac{v}{c} \right) \right) C_L A\Psi(r,t) - C_L A\Psi(r,t) \right) + \frac{\left(\frac{p}{\rho} \right)}{c^2} C_L A\Psi(r,t) \right)^{Local}$$

By local, I mean our respective reality, made of particles of air where a plane flies through it with passengers on board.

$$AeroDynDragForceOnPlane = \left(m * \left(Cos\left(ArcSin\left(\frac{v}{c} \right) \right) C_D A\Psi(r,t) - C_D A\Psi(r,t) + \frac{\left(\frac{GM}{r^2} \right) h}{c^2} C_D A\Psi(r,t) \right) \right)^{NonLocal}$$

By non-local, I mean the Gravity field plane where combined mass in a geometric location regulates the sizes of mass depending on its position within that field. Drag is seen as ripples / disturbances in that field due to movement.

Ok, so what does this formula give us over the existing force formulas? Let's call them out.

1. It explains how to model drag and lift in the equations
2. It shows how a change to one orthogonal plane affects another similar to the Einstein's Field Equations
3. It has relativistic velocity. We can't get more than E=MC^2 when V=C. See the original derivation.
4. It shows how the diameter of a particle is based on how combining both diameters can create an observable. We're not dealing with probabilities.
5. It shows how there is a quantum wave function associated with Classical movement extending the Schrödinger approach. This is **very important** for aerodynamics as the shape of these wave functions effect efficiency of lift versus drag. This is what the stream lines around planes are modeling.

There are other reasons but these are my top five. Later, I'll explain why pressure drops when a liquid passes through a narrow channel and effectively speeds up and also cover the Navier Stokes equation. There is also the thorny issue of Pascal's Law where we show how pressure is transmitted through the liquid. How does this work in Pi-Space?

1.29 Pascal's Law

Pascal's law states that "pressure exerted anywhere in a confined incompressible fluid is transmitted equally in all directions throughout the fluid such that the pressure ratio (initial difference) remains the same."

There are two aspects to pressure. There is gravitational pressure (non local) and there is hydraulic pressure (local).

First, we have Gravitational pressure.

$$\Delta P = \rho g(\Delta h)$$

Then we have Hydraulic Pressure. The pressure is the same at all points.

$$P_1 = P_2$$

$$\frac{F_1}{A_1} = \frac{F_2}{A2}$$

We add these two to get the total effect.

$$Total\ \Pr essure = \rho g(\Delta h) + P_1$$

Let's map these to the Pi-Space formulas. We have the local and non-local plane.

$$\left(m*\left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t) - \Psi(r,t)\right) + \frac{\left(\frac{p}{\rho}\right)}{c^2}\Psi(r,t)\right)^{Local}\left(m*\left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t) - \Psi(r,t) + \frac{\left(\frac{GM}{r^2}\right)h}{c^2}\Psi(r,t)\right)\right)^{NonLocal} *$$

Velocity is 0, so this simplifies

$$\left(-\frac{\left(\frac{p}{\rho}\right)}{c^2}\Psi(r,t)\right)^{Local}\left(m*\left(+\frac{\left(\frac{GM}{r^2}\right)h}{c^2}\Psi(r,t)\right)\right)^{NonLocal} *$$

Note, in the above formula, we model movement upwards but this is downward pressure, so we change the sign for Gravity. We move down so we get a minus. Therefore both pressures combine to shorten the diameter / wavelength.

$$\left(+\frac{\left(\frac{p}{\rho}\right)}{c^2}\Psi(r,t)\right)^{Local}\left(m*\left(-\frac{\left(\frac{GM}{r^2}\right)h}{c^2}\Psi(r,t)\right)\right)^{NonLocal} *$$

Both axes contribute to the force, so we can add them together.

Let's figure out where the Pressure is in the formula which is defined as Force / Area. From Conservation of Energy we know that we cannot increase the work done. Therefore, this expression conserves energy.

$$TotalEnergy = \left(+\frac{\left(\frac{p}{\rho}\right)}{c^2}\Psi(r,t)\right)^{Local}\left(m*\left(-\frac{(g)h}{c^2}\Psi(r,t)\right)\right)^{NonLocal} *$$

However, Pascal's Pressure is everywhere in the liquid, and it's possible to multiply it. How can this be? Therefore, Pascal's Pressure maps to the Wave Function part of the expression because it spreads through out the whole liquid at all points.

$$\Pr essure \propto \left(-\Psi(r,t)\right)^{Local}\left(\left(-\Psi(r,t)\right)\right)^{NonLocal}$$

Let's talk about the speed of transmission.

In the local plane (for hydraulic forces) the maximum transmission is Speed of Light "C". This is the same as the speed of electricity in a wire.

In the non-local plane where we have a Gravity field, this is the non-local speed, this pressure appears **instant**. If you're unsure about this, please read up on Quantum Entanglement and non-local changes. This is where I derive this reasoning. All that a non-local wave means is that its wave update is done before the local wave, therefore it appears to be faster than the speed of light AKA instant. The non local wave travels at max C relative to its own wave plane.

The total Force component is the typical Newtonian style pieces.

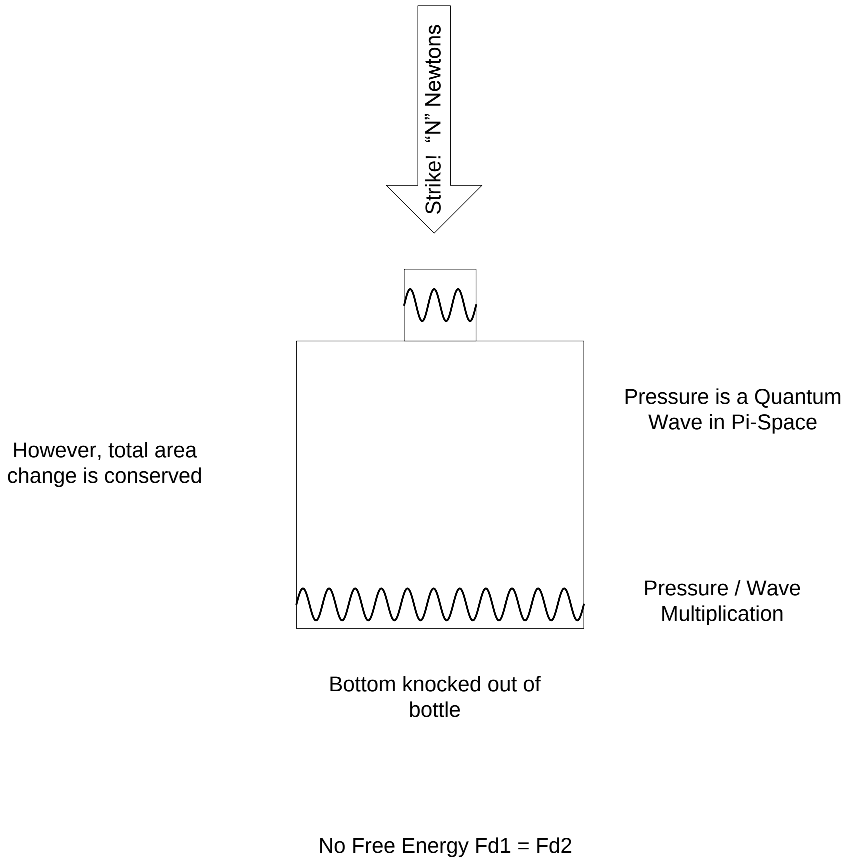
$$\text{ForceOfPressure} = \left(+ \frac{\left(\frac{p}{\rho}\right)}{c^2}\Psi(r,t) \right)^{Local} \left(m * \left(- \frac{\left(\frac{GM}{r^2}\right)h}{c^2}\Psi(r,t) \right) \right)^{NonLocal} *$$

This maps to

$$Total \Pr essure = P_1 + \rho g(\Delta h)$$

Therefore, in Pi-Space Pascal's pressure transmission is realized by the combined Quantum wave functions (local and non-local) which spread through all points in the liquid. This affects the particles because they are bound to the wave functions. The local wave function is bounded by the closed container for hydraulic pressure. For a Gravity field, the wave function is both inside and outside the container and the height difference represents the pressure (wave) different.

Let's draw the Pressure multiplication idea in Pi-Space showing it as a Quantum Wave.



For a Hydraulic press, total energy is conserved so there is no multiplication of work (area change) however, there may be multiplication of the wave function based on the shape of the object in question.

1.30 Bernoulli High Velocity and Low Pressure

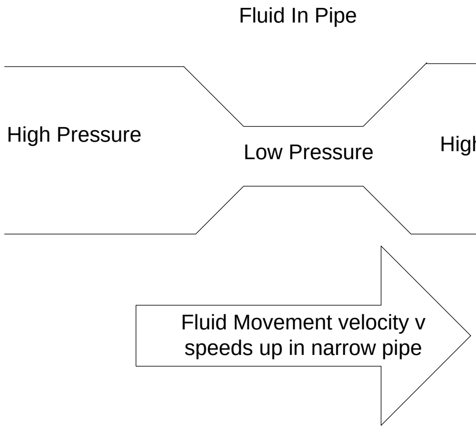
Johann Bernoulli explained the Mathematical idea of why a fast velocity equals low pressure.

He explained that for an Incompressible fluid in a streamline, that the total energy of that streamline is constant.

$$\frac{v^2}{2} + gz + \frac{p}{\rho} = const$$

If a fluid containing stream lines moves into a narrowing tube, then the velocity picks up and pressure drops.

For consistency reasons, moving forward with the formulas I will use mass density in place of mass as it also contains volume which is also consistent with Pi-Space.



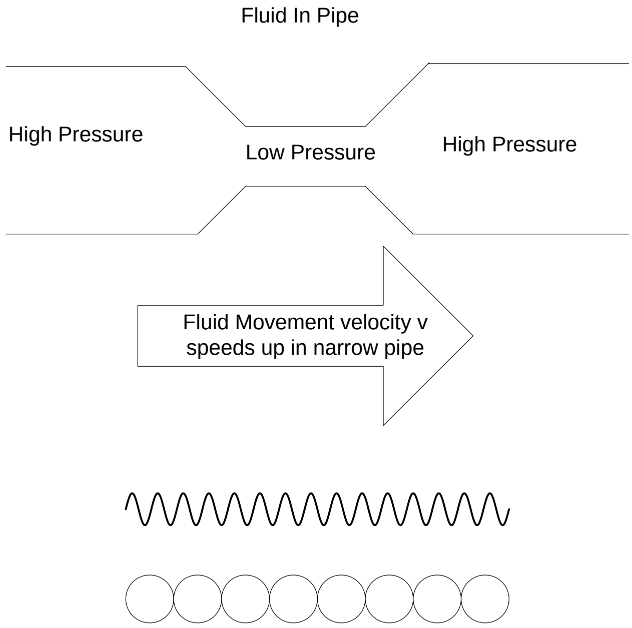
For the most part, we know this is true but few if any people find it intuitive. Let's explain this in Pi-Space and explain why this is happening. We model this using the Pi-Space formula.

$$\left(\left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t)-\Psi(r,t)\right)+\frac{\left(\frac{p}{\rho}\right)}{c^2}\Psi(r,t)\right)^{Local}\left(\rho*\left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t)-\Psi(r,t)+\frac{\left(\frac{GM}{r^2}\right)h}{c^2}\Psi(r,t)\right)\right)^{NonLocal} *$$

For this simplified example, we can ignore the effect of Gravity.

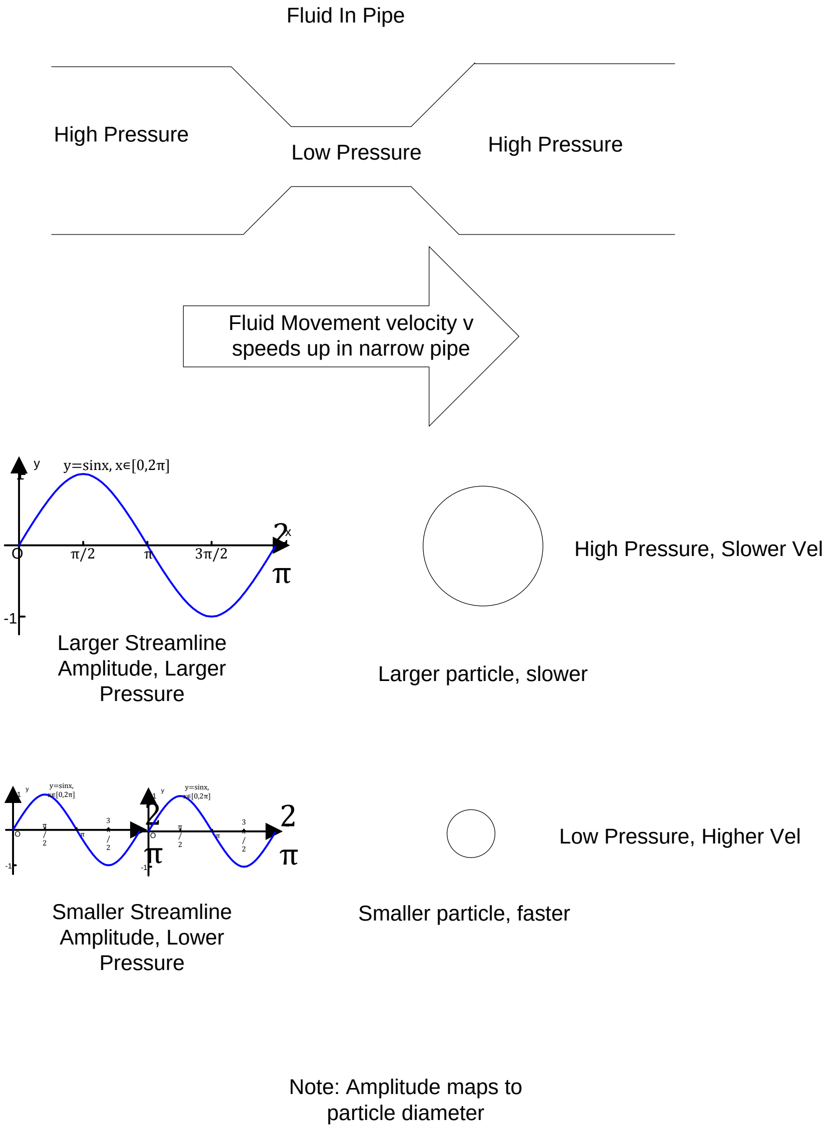
$$\left(\left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t)-\Psi(r,t)\right)+\frac{\left(\frac{p}{\rho}\right)}{c^2}\Psi(r,t)\right)^{Local}$$

Now, unlike the Pascal's pressure example, we have movement with velocity v in a streamline. In Pi-Space, we can model the stream line in two ways. We can visualize a channel of particles but we can also have a quantum wave function with a distinct amplitude. Both are valid according to the formula, so there are two views of the same thing.



Streamline as wave and particles. Both bound to one another. Wave Particle Duality.

In the Pi-Space function, we model velocity as a shortening of the diameter of the particle. Therefore, using the relativistic notation we see movement as a diameter shortening or in the case of a wave, the amplitude of the wave shortens. As a consequence of the amplitude shortening, the wave frequency increases. Also in previous lectures on Pascal’s Law, I showed that Pressure is related to the wave function. **Therefore in Pi-Space a larger streamline amplitude means that a particle flow has higher pressure and a smaller amplitude has lower pressure.** Note that when the streamlines enter the narrowing channel, the amplitude of those streamlines decrease and the pressure consequently drops. **However, the diameter of the particle is shorter so the particle moves faster.** In the classical view, there is no concept of a wave function travelling in a liquid or that the amplitude lessens as it moves into a narrow channel and that it speeds up. There is also no relativistic view of diameter change mapping to a particle moving faster. This is intuitive view of how this works in Pi-Space. Note: The diameter changes due to movement are relativistic and detailed in the Advanced Formulas and Introductory section of Pi-Space and are foundational to the theory.



To understand for example, how a plane wing works using this principle and produces lift, we need to understand one more concept which is the Principle of Least Time or Action which I will cover next.

1.31 The Reason For Movement Of A Free Particle In A Particular Direction

In Pi-Space there is a general rule for a freely moving particle to choose to move in a particular direction. This is the path that Einstein called the Geodesic. There is also the idea of path of Least Action or Least Time. The Pi-Space rule also covers a planet or a space craft in space. It also covers the weather. It covers wind moving from High Pressure to Low Pressure. These are all example of the same thing in Pi-Space because they all map back to the particle's diameter and the associated Quantum wave function. Once more, we return to the Pi-Space formula for the Local and non Local plane.

$$\left(\left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t)-\Psi(r,t)\right)+\frac{\left(\frac{p}{\rho}\right)}{c^2}\Psi(r,t)\right)^{Local}\left(\rho * \left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t)-\Psi(r,t)+\frac{\left(\frac{GM}{r^2}\right)h}{c^2}\Psi(r,t)\right)\right)^{NonLocal} *$$

We have movement on the local plane such as on a planet. We have air pressure. On the non Local plane, we have velocity due to a Gravitational field and we also have the Potential Energy of the field itself.

The Pi-Space principle for direction of movement of a particle is that any freely moving particle will chose to move in the direction where its diameter becomes the shortest. In wave terms where this is where its wavelength becomes the shortest. In amplitude terms this is where its amplitude becomes the smallest. Whatever path provides that result then the particle or wave will follow that path.

Let's take some practical examples.

1. Center of Gravity is the place where the diameter is the shortest.
2. Wind moves from High Pressure to Low Pressure. Low pressure is where amplitude is the smallest.

$$Direction = MinAmplitu\,dePathOf\left\{(...)^{Local}(...)^{NonLocal} *\right\}$$

If we have more than one effect, which is typically the case, we add up results to figure out the resulting direction. Please see my documentation on calculating Orbits in the Advanced Formulas section and why we get an ellipse.

Once this principle is understood, then we can move onto the plane wing next and explain why it produces lift because of the pressure difference, or how the movement of air over some surfaces produces lift or various interesting Bernoulli effects.

1.32 The Reason For A Plane Wing Lifting In Pi-Space

There are important questions surrounding a plane wing producing lift using any theory. Let's answer the plane wing lifting in terms of answering these elementary questions for the Pi-Space case. Fist, let's define the questions.

1. Where is the lift on the plane wing?
2. What is theoretical reason for the lift?
3. How is it achieved?

Where is the lift?

According to the Pi-Space Theory, the upper surface of the front part of the wing is the primary place which generates the wing lift (where the streamlines are compressed the most). Lift is also present on the upper surface but decreases as one moves backwards as the streamlines become less compressed.

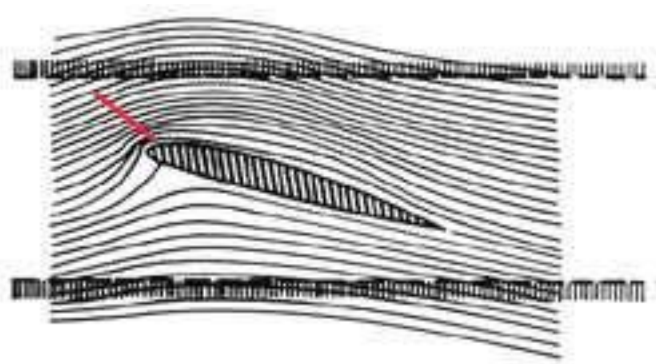
What is the theoretical Basis?

The theoretical reason for lift is that the atoms of the wing are choosing to move towards a place where their atomic diameters will become the smallest due to interaction with the most compressed local quantum wave functions (expressed in classical terms as local compressed streamlines).

How is it achieved?

Lift is achieved by compressing streamlines around this forward point on the wing such that their pressure is higher above the wing than below the wing. Therefore, the wing's atoms choose to move up towards that place.

It's difficult to draw this by hand so I'll use a real wind tunnel diagram. I've marked the primary area out in red. Note how the streamlines are most compressed here. This is the place where the lowest pressure is. I've already explained the low pressure means wave functions with low amplitude. Here the air particles also move the fastest over the wing but the key point in Pi-Space is that the wave functions here are compressed the most. The wave functions surround the wing but do not pass through it. The air follows the path of these streamlines.



In Classical Physics, we think of Pressure as not having a Quantum Wave function. In the Pi-Space Theory however, pressure is just one of the reasons which alters the underlying wave functions, making the wavelength shorter / amplitude smaller. There are many wave functions which represent the path that air particles will follow around a wing. These are characterized by what Classical physics / Aerodynamics calls "Streamlines". Gravity also has a wave function but velocity and pressure combine to create their own wave functions on what I call the Local plane. By compressing the wave functions at the front of the plane wing, we can create an upward pointing compressed wave function which is greater than the Quantized Gravity wave function. What this means is that the mass of the planes wing chooses to move up in this direction as opposed to downward towards the center of Gravity. Let's understand this in terms of the Pi-Space Quantum Gravity function.

$$\left(\left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t)-\Psi(r,t)\right)+\frac{\left(\frac{p}{\rho}\right)}{c^2}\Psi(r,t)\right)^{Local}\left(\rho*\left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t)-\Psi(r,t)+\frac{\left(\frac{GM}{r^2}\right)h}{c^2}\Psi(r,t)\right)\right)^{NonLocal} *$$

Therefore we have a local wave function and a non local wave function which the mass interacts with, deciding on in which direction to move. In the case of a plane wing, at the forward section of the wing, the local wave function is greater than the non local wave function. Therefore we can define Aerodynamic Pressure Based Lift as follows in a mathematical wave. We discount the Coefficients of lift and drag for now.

$$PressureAndVelocityWaveFunctionOnWing = \left(\left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t) - \Psi(r,t)\right) + \frac{\left(\frac{p}{\rho}\right)}{c^2}\Psi(r,t)\right)^{Local}$$

$$GravityWaveFunctionOnWing = \left(\rho * \left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t) - \Psi(r,t) + \frac{\left(\frac{GM}{r^2}\right)h}{c^2}\Psi(r,t)\right)\right)^{NonLocal}$$

To achieve lift, pressure and velocity wave function must be greater than Gravity. Note: The greater the velocity, the lower the pressure (shorter wavelength/smaller amplitude).

$$Lift = PressureAndVelocityWaveFunctionOnWing > GravityWaveFunctionOnWing$$

This idea assumes that the wing is designed to produce an up force. Racing car drivers for example use the wing the other way around to produce a down force.

Adding the coefficients next, see previous section on Lift and Drag.

$$AeroDynLiftForceOnPlane = \left(\left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)C_L A\Psi(r,t) - C_L A\Psi(r,t)\right) + \frac{\left(\frac{p}{\rho}\right)}{c^2}C_L A\Psi(r,t)\right)^{Local}$$

By local, I mean our respective reality, made of particles of air where a plane flies through it with passengers on board.

$$AeroDynDragForceOnPlane = \left(\rho * \left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)C_D A\Psi(r,t) - C_D A\Psi(r,t) + \frac{\left(\frac{GM}{r^2}\right)h}{c^2}C_D A\Psi(r,t)\right)\right)^{NonLocal}$$

The coefficients factor in the shape of the object and its surface area. Therefore, depending on the shape of the object, we get lift in difference places having different strengths and vice versa for drag.

Final comments:

The Pi-Space Theory does not support the “Longer Path” or “Equal Path” Theory. The Pi-Space Theory formulas lift is based on competing wave functions where the mass of the moving object’s mass (the wing in this case) moves towards the wave function representing the shortest wave length.

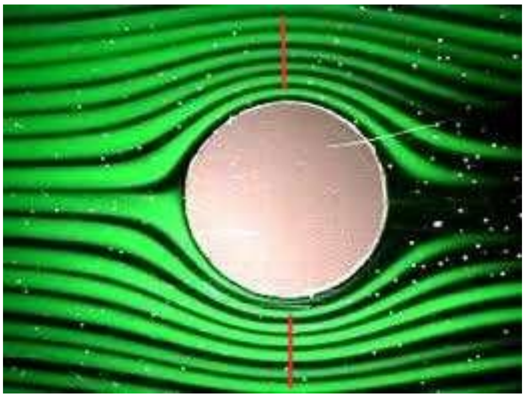
The Pi-Space Theory does not support the idea that air particles colliding with the lower surface force the wing upward. The reason for this idea being rejected is that the streamlines are the paths that the air / liquid particles follow which are in fact (according to the theory) wave functions which pass around the solid object such as the wing. These wave functions are present in the liquid and their spread is inversely related to the viscosity of the liquid. Note: I'll do a separate section on how solid objects interact and Newton's Third Law.

The Pi-Space Theory therefore supports the Bernoulli idea and extends it to include Quantum wave functions. Later, I'll cover the more complete Navier Stokes equation which includes pretty much all the variables in all dimensions. I've yet to cover Mach number, temperature and so on.

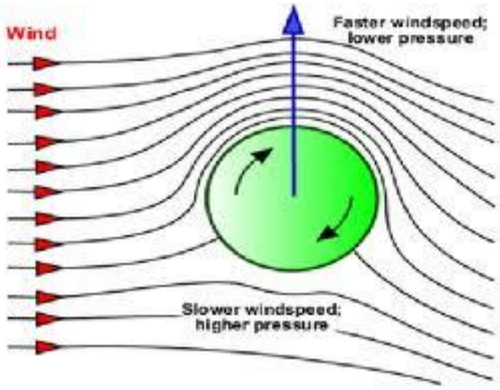
1.33 Airflow Around a Ball

Two further examples to consolidate the idea of the mass of an object moving towards the most compressed field lines where the field wavelength is the shortest.

1. Leaf blower holds a ball in place mid air. The reason is that the ball (or curved object) is moving towards the most compressed streamlines (shortest wavelength). Therefore, the ball moves left to right defying gravity. The streamlines move around the ball, not colliding with it.

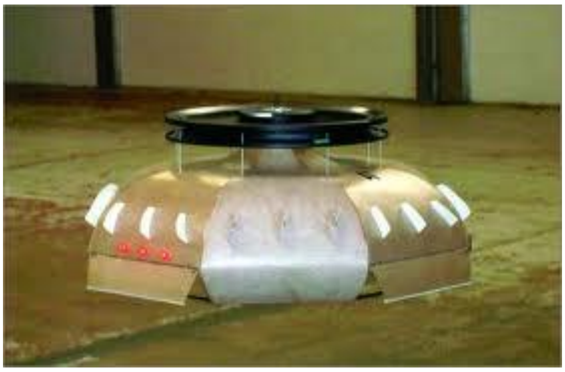


2. In baseball/football spin is placed on the ball and the compressed lines are more on one side than the other. We get curve.



1.34 Designing an Efficient Cost-Effective Lift System – A Brady Carousel

All right now that we know why pressure produces lift, the next step is to come up with a better design than the plane wing which is cost efficient. In Physics at present, it is thought that the Pressure based lift mechanism is an atmospheric effect. However, if we look at the Pi-Space formula for lift, we see that the quantum wave function is altered by velocity and pressure. So in theory, to produce lift under Gravity all one has to do is move a fast moving liquid with low viscosity over a surface at high speeds and it will move towards it. Henri Coanda discovered this and this is the basis of current UFO-like designs.



These objects will produce lift for the reason I have explained earlier. The curved surface mass is moving towards the place where the wave functions are the shortest which is around the surface.

Now, how to we improve the lift? The answer is to “simply” run a fast moving stream of particles with low viscosity over a surface of mass m which is lying horizontal to Gravity. According to this theory, this is how a UFO (if they exist) achieves such high upward acceleration. Inside the craft is some kind of fast moving fluid with low viscosity which is accelerated in a circular path like a particle accelerator? We do NOT flow the air over a wing surface, we accelerate the liquid **inside** the craft. The liquid may be moved physically by some means of jet technology but a smarter way may be to use magnetic fields to cause the liquid to spin and hold it in place. There must be heavier mass m under the flow than above the flow to effect an uplift. Therefore, the liquid is inside the craft and flowing over some surface. The mass under the flow will choose to move up in the direction of the fast moving fluid. This is what NASA should work on as a replacement for the rocket based technology in my humble opinion.

Therefore, using this theoretical idea, we can get anything to lift. Cars, bikes, automobiles, space craft. The best part about this design is that the lift mechanism is inside the object being some kind of spinning liquid.

My name for this design is a 'Brady Carousel'.

In this video, I show how an object / surface becomes lighter with an air flow over it. It does not have to be a wing.

http://www.youtube.com/watch?v=IBP2z5rA56A

1.35 The Lagrangian

Joseph Louis Lagrange defined the energy of a system for the Path of Least Action as follows.

$$L = T - V$$

T is the Kinetic Energy

V is the potential Energy

Therefore, mapping this to Pi-Space, the Lagrangian is dealing with the energy change of a Pi-Shell and is similar to the Hamiltonian. In Pi-Space, Kinetic Energy is area loss due to movement. If one moves up under Gravity then this is an energy gain.

The area loss of Kinetic Energy translates to a particle with a smaller diameter and the potential energy maps to a larger diameter. Let’s take a look at the Pi-Space function and see where it fits in.

$$\left(\left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t)-\Psi(r,t)\right)+\frac{\left(\frac{p}{\rho}\right)}{c^2}\Psi(r,t)\right)^{Local}\left(\rho*\left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t)-\Psi(r,t)+\frac{\left(\frac{GM}{r^2}\right)h}{c^2}\Psi(r,t)\right)\right)^{NonLocal} *$$

The non-local plane covers the Gravity field with acceleration g. mgh forms the potential. The expression to the left of the non local function is the equivalent kinetic energy. If you are unsure about this please refer to the derivation earlier on. Therefore the Lagrangian is equivalent to this.

$$L = T - V = \left(\rho * \left(Cos\left(ArcSin\left(\frac{v}{c} \right) \right) \Psi(r,t) - \Psi(r,t) + \frac{\left(\frac{GM}{r^2} \right) h}{c^2} \Psi(r,t) \right) \right)^{NonLocal} \quad *$$

Please note that Pi-Space relates the Kinetic Energy and the Potential Energy to the diameter change so Kinetic Energy is a shortening and the Potential Energy is a lengthening while moving away from the center of Gravity.

1.36 Categorizing the Type of Navier Solution Described in Pi-Space

The Pi-Space solution for Navier-Stokes can be termed a "self similar focusing solution". All that this means in Pi-Space is that the atoms become smaller due to velocity and pressure. Potential energy is a gain in the diameter. These rules are not special for Navier Stokes, they are the basis for relativity and also hold for the EM work as I've already shown. Viscosity is just a dampening of the Quantum wave function and limits the action of the circular motion for vortices similar to a magnetic field on the magnetic / non local plane.

Before I jump into the equations proper, I'll do the Laplacian which is related to the local plane in the Pi-Space equation and then Euler.

1.37 Representing Gravity As Field Flux Inside A Sphere

To explain the Laplacian I'll need to explain the Divergence Theorem and the Gradient. This also leads to explaining the "other" way to explain Gravity, namely Gauss' law (flux passing through an object). So far in the Theory I have represented the Pi-Space Theory in terms of the Newtonian viewpoint where we have a Kinetic and a Potential Energy. We have velocity and acceleration. However, Laplace decided to use Calculus and we have the Divergence Theorem which is an early form of Gravity field Theory before the more established Einstein GR one. We have containers and flux passing in and out of them (a planet in this case). Gauss worked off these Laplacian ideas from what I see and derived his version of Gravity and it looks like this like minded group of individuals have embedded Gravity constant g into the Gradient idea which is part of a second over partial differential equation (yikes) and this is what Navier Stokes uses... However, fear not, Pi-Space is here. Once more I have to explain the following pieces in Pi-Space... We can map these ideas to Pi-Space so this is what I'll do shortly.

1.38 The Divergence Theorem and the Gradient

In Pi-Space, force is an area change in the particle relative to an observer. Therefore by implication the volume of the object is changed. In Physics, many of the early field theory considered fields passing through a closed surface like a sphere and calculated the change to the volume object which turned out to be a change in the area of the sphere. Notations and terms were developed. From this basis, certain Math operations were developed. In the case of the Laplacian Operator we talk about the Divergence and the Gradient. We also use Calculus for this case. This is the other way to describe a field altering the area of the Pi-Shell in Pi-Space compared to the Newtonian approach. However, the alternative notation can be mapped in a similar way to the Newtonian work.

In the Divergence Theorem, we consider the flux which is a field passing through the volume of a sphere and changing its volume. A theorem by Gauss shows that the flux change in volume is the same as the change in the area of the sphere. Therefore, the change to the surface area is caused by the enclosed flux. The flux may be the product of an electric field or a Gravitational field.

$$\Phi_D = \oiint_s D.dA$$

And

$$\nabla.D = Divergence$$

In Pi-Space what this means is the total area change to the surface of the sphere due to a field effect expressed as a flux. Area change units are 1/c^2. This is all that the Divergence means.

$$\nabla.D = \frac{1}{c^2} AreaChange$$

So, how do we represent the rate of change of velocity (acceleration)? This is called the Gradient and has a slightly different Notation. It is a scalar and points toward the center of the field.

$$\nabla f = \frac{\partial f}{\partial x} i + \frac{\partial f}{\partial y} j + \frac{\partial f}{\partial y} k$$

The Laplace Operator combines both the Gradient and the Divergence together, so it’s combining the total area change with the acceleration of the field.

$$\Delta f = \Delta^2 f = \nabla.\nabla f$$

Interpreting this in Pi-Space, the Laplace operator models the total area change of a sphere (divergence) which produces an acceleration (gradient) based on some field that is modeled as a flux.

Let's compare this to the Newtonian version as both are essentially describing the same idea.

$$g = \frac{GM}{r^2}$$

Interpreting this in Pi-Space, this formula models the acceleration which is the product of the total area change of a sphere of radius r which is caused by the mass of the object times a constant and divided by the distance to the center of Gravity in order to calculate area change per atom.

So what's different between the two approaches? The Laplace Operator focuses on the total area change within a defined area and the Newton focuses on the acceleration however both contain the same basic information of area change and acceleration. The Newtonian approach models the area change per atom by dividing by the radius which is very useful. The Laplace operator creates a vector field but we can add a vector for each atom as I'll show.

The Laplace operator is expressed in Calculus, it's a second order partial derivative based on Cartesian co-ordinates where we model the total volume in a three dimensional area. So we need to differentiate to move from area to atom and atom to area. In the Newtonian work, we have Potential and Kinetic energy which works like area addition and subtraction which simplifies the whole process somewhat.

$$\Delta f = \frac{\partial^2 f}{\partial x^2} i + \frac{\partial^2 f}{\partial y^2} j + \frac{\partial^2 f}{\partial z^2} k$$

Let's compare this to the Pi-Space formula which also calculates the total area change for forces on a plane.

$$\left(\rho * \left(Cos\left(ArcSin\left(\frac{v}{c} \right) \right) \Psi(r,t) - \Psi(r,t) + \frac{\left(\frac{GM}{r^2} \right) h}{c^2} \Psi(r,t) \right) \right)$$

Specifically, total area change to sphere due to mass for the Lagrange Operator (which causes the field effect) is

$$\nabla . D = Divergence = -4 \pi GM$$

Later, I'll show the Gauss formula for this in more detail.

Also, the acceleration piece called the Gradient can be mapped as follows.

$$\frac{GM}{r^2} = g = \nabla f$$

Then using the Laplace idea we can convert a vector acceleration to a scalar divergence (total area change of sphere for example based on an acceleration)

$$\nabla . g = -4\pi GM$$

This is the area change to a sphere with unit radius 1 for the Laplace operator.

So the idea is that we can convert the area change to an acceleration, and the acceleration to an area change. The area change is typically called the Gravitational Potential in Pi-Space but we're not dividing by radius r so it's not per atom. So let's see how we can get the acceleration from a Gravitational Potential in Pi-Space. If we add the radius to make the vector field per atom, we can compare the two ideas. This is analogous to multiplying the total gravity value by radius r (which is a form of differentiation to those who know it).

$$\frac{\nabla g}{4\pi r^2} = \nabla . \nabla f$$

A more complete Pi-Space version is

$$\frac{\left(\frac{\nabla g}{4\pi r^2}\right)}{c^2} = \nabla . \nabla f$$

Ok so what are we missing? We're missing the three-dimensional x,y,z piece where the Laplacian is not just one Pi-Shell. In theory, we can use the Pi-Shell Generalization principle where we can model a large Pi-Shell as a sum of the smaller Pi-Shells. This is how we model a planet for example and it works. Therefore if we have a fluid flow, we can model one piece of it as one large Pi-Shell experiencing forces made up from smaller Pi-Shells.

The other nice thing about the Pi-Space formula is that it can therefore express both the Lagrangian idea and the Laplacian idea for a point in a fluid flow.

So we can represent the Laplacian Operator in the Pi-Space formula as follows. It is essentially representing the total change of area due to fields.

Simply, we can say for Gravity the following (where we are per atom)

$$\left(\rho * \left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t) - \Psi(r,t) + \frac{(\nabla g)h}{c^2}\Psi(r,t)\right)\right)$$

And logically, the total area change is the sum of all the parts which is all that the Laplace operator is modelling. This is like the Divergence but we model per atom based on the radius and we take into account the Kinetic component. We also break out acceleration and there is no differentiation required.

$$\Delta p \approx \left(\rho * \left(Cos\left(ArcSin\left(\frac{v}{c} \right) \right) \Psi(r,t) - \Psi(r,t) + \frac{\left(\frac{GM}{r^2} \right) h}{c^2} \Psi(r,t) \right) \right)^{NonLocal}$$

And

$$\Delta p \approx \left(\left(Cos\left(ArcSin\left(\frac{v}{c} \right) \right) \Psi(r,t) - \Psi(r,t) \right) + \frac{\left(\frac{p}{\rho} \right)}{c^2} \Psi(r,t) \right)^{Local}$$

This is for the Laplace operator in one axis only (movement h in either the x,y or z axis. Also we can think in terms of a local Laplace and a non local Laplace (two different area changes). Instead of Gravity on the non local plane we have pressure causing the area change. I've modeled this as a Quantum wave function which can be seen in terms of a flux. Mass and density are interchangeable in Pi-Space because of our ability to model a large single Pi-Shell by smaller ones.

1.39 Gauss and Poisson and the Laplace Operator

In Pi-Space therefore, we see everything in terms of total area change and the acceleration which is the area change in the direction of the field from an atomic viewpoint. We have two familiar cases of fields, we have Gravity and Electricity.

$$\nabla . E = \frac{\rho}{\varepsilon_0}$$

And Gauss with a Gravity field.

$$\nabla . g = -4\pi GM$$

Therefore, we can also think of Pressure creating an area change on atoms in an area.

1.40 Calculating with Wave and Function

In case one is wondering how one calculates with a wave function and a value. The idea is pretty simple just find out the Eigen value and Eigenvector. So if something lowers pressure on the local plane and the associated wave function, velocity shares the same wave function so therefore velocity needs to change to match the new wave function. All one needs to do is find the Eigenvector and Eigen value for velocity. I think of this as a scaling value for an identity matrix. This is as much as I want to cover on this for the moment. I'll try to show some worked examples later but the theory is the most important part at the moment.

1.41 Convective Acceleration / Advection

In Pi-Space, we break up non-charged mass onto two planes similar to Electro Magnetism. The gravity field is on one plane (non local) and the moving particles on the other plane (local). Both are orthogonal to one another and changes on one plane affect the other plane.

$$\left(\left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t)-\Psi(r,t)\right)+\frac{\left(\frac{p}{\rho}\right)}{c^2}\Psi(r,t)\right)^{Local}\left(\rho*\left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t)-\Psi(r,t)+\frac{\left(\frac{GM}{r^2}\right)h}{c^2}\Psi(r,t)\right)\right)^{NonLocal} *$$

In the more general case where we have a fluid, as opposed to say a solid object, we need to take into account what is called Convective Acceleration in the Navier Stokes equation. This topic is just covering the Convective Acceleration piece and not the whole equation for now. It is instructive to break it out to cover it separately as it is an important principle.

Navier Stokes equation covers this Convective Acceleration piece using the following notation.

$$v.\nabla v$$

This fits into the general equation as follows. The Material Derivative is on the left.

$$\rho\left(\frac{\partial u}{\partial t}+u.\nabla u\right)=-\nabla p+\nabla.\mathrm{T}+f$$

Where

P is pressure
T is the Stress Tensor
F is external body force Gravity
U is velocity
Rho is density

Let’s rearrange the formula so that the convective acceleration is on the right hand side and we can begin to explain how it fits in with the Pi-Space formulation. T is broken out to contain viscosity v.

$$\frac{\partial u}{\partial t}=-\frac{1}{d}\nabla p+v\nabla u+f-u.\nabla u$$

Let’s break it out into the two planes, namely local (pressure) and non-local (gravity).

$$\frac{\partial u}{\partial t} = \left(-\frac{1}{d} \nabla p + \nu \nabla u \right)^{local} \left(+ f - u.\nabla u \right)^{nonLocal}$$

Therefore on the local plane we have pressure and viscosity. Also, we have gravity f and the Convective Acceleration on the nonlocal plane.

We can break out Convective Acceleration into its constituent components. We use v for velocity.

$$v.\nabla v = \nabla \left(\frac{\left\| v^2 \right\|}{2} \right) + (\nabla x v) x v$$

Also we have a vorticity defined as

$$\omega = \nabla x v$$

Therefore, we have a Gradient and we have a circular vortex.

Before we talk about how to map this to Pi-Space, the first question that needs to be answered is why is it there at all? The answer according to the Pi-Space Theory is that the vortex appears because of a disturbance of the Gravity field due to relative motion of the fluid. The field effect is therefore on the non local plane where the Gravity field is and is there to conserve energy. Vortices manifest themselves as a quantum wave function which is a disturbance in the gravity field. Their spread is limited by viscosity and any solid object which may impede or contain a flow. They are analogous to a magnetic field in that their presence is due to the presence of velocity relative to an observer but unlike them in that their spread is limited as already stated. Movement is on the non local plane which is perpendicular to the flow of the object. Therefore when vortex forms it is a circular field effect due to a disturbance of the Gravity field and strength is based off the area change due to the velocity.

Ok so let’s add it to the equation. We do not consider the spread but rather the strength due to velocity. In Pi-Space, we model the vortex as a gain in the size of diameter of a Pi-Shell / particle and offset this against the area loss due to velocity within the fluid, thus conserving energy. Note: In Pi-Space, we equate area loss of a Pi-Shell to energy loss and area gain to energy gain (KE loss = PE gain). See Classical and Relativistic work. For now, we just add it with Gravity force f.

$$\left(\rho * \left(Cos\left(ArcSin\left(\frac{v}{c} \right) \right) \Psi(r,t) - \Psi(r,t) + \frac{\left(\frac{GM}{r^2} \right) h}{c^2} \Psi(r,t) + v.\nabla v \Psi(r,t) \right) \right)^{NonLocal} \quad *$$

We also know that the vortex is like a magnetic field in that it creates a circular field in another plane, therefore we can model it on its own orthogonal plane

This is calculus so in Pi-Space we need to think about the vortices in terms of having a maximum radius r "spread" and one's distance r from the center of the vortex v. Total area change however is v^2 for the purpose of this equation.

$$\left(\rho * \left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t) - \Psi(r,t) + \frac{\left(\frac{GM}{r^2}\right)h}{c^2}\Psi(r,t) + \frac{v^2}{c^2}\Psi(r,t)\right)\right)^{NonLocal} *$$

Note: To model the entire fluid, we need to model all the wave functions first and then move all the particles within that field and continuously iterate. I'll deal with this in a separate post. For now, we just focus on a particle creating a vortex due to velocity

This is a vortex field within a Gravity field therefore we model it as its own Hamiltonian to conserve energy. Let's call it the Vortex.

$$\left(\rho * \left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t) - \Psi(r,t) + \frac{v^2}{c^2}\Psi(r,t)\right)\right)^{Vortex} *$$

And we return to the original non local definition for Gravity

$$\left(\rho * \left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t) - \Psi(r,t) + \frac{\left(\frac{GM}{r^2}\right)h}{c^2}\Psi(r,t)\right)\right)^{NonLocal} *$$

Let's return to the original definitions.

$$\frac{\partial u}{\partial t} = \left(-\frac{1}{d}\nabla p + \nu\nabla u\right)^{local} (+\ f - u.\nabla u)^{nonLocal}$$

Let's consider what I call the non local pieces

$$(+\ f - u.\nabla u)^{nonLocal}$$

So we get

$$f = \left(\rho * \left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t) - \Psi(r,t) + \frac{\left(\frac{GM}{r^2}\right)h}{c^2}\Psi(r,t)\right)\right)^{NonLocal} *$$

and

$$v.\nabla v \approx \left(\rho * \left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t) - \Psi(r,t) + \frac{v^2}{c^2}\Psi(r,t)\right)\right)^{Vortex} *$$

Which is the same as

(Note: We can solve for acceleration from total energy reasonably easily in Pi-Space, see section Advanced formulas.)

$$\nabla\left(\frac{\|v^2\|}{2}\right) + (\nabla x v) x v \approx \left(\rho * \left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t) - \Psi(r,t) + \frac{v^2}{c^2}\Psi(r,t)\right)\right)^{Vortex} *$$

Breaking it out

$$\nabla\left(\frac{\|v^2\|}{2}\right) \approx \left(\rho * \left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t) - \Psi(r,t)\right)\right)^{Vortex} *$$

Plus

$$(\nabla x v) x v \approx \left(\rho * \left(\frac{v^2}{c^2}\Psi(r,t)\right)\right)^{Vortex} *$$

So to recap, Pi-Space sees the Vortex as a disturbance in the Gravity field due to fluid movement and is thus a relativistic effect. This creates a Vortex field effect which interacts with the fluid. The limiting factors of the field effect are the fluid properties and shape of the container if one is present and covered by Navier Stokes in the stress tensor.

Modeling the vortex radius.

Let's say we have a plane wing, therefore if we solve for vortex v using Navier Stokes, this means in one second, we will get a vortex with a radius of v. The energy of this vortex is constant 1/2mv^2 so it will grow in size by v times t but the gradient will drop because vortex a=v^2/r. Therefore, the vortex will dissipate.

1.42 Stress in a Fluid

In Pi-Space, the shear stress on a fluid is on the local plane. The wave functions are suppressed by viscosity. The Reynolds' number models the total wave function within the shape of the object in question (see earlier post). So, we model dynamic viscosity limiting the area change due to velocity and is a scaling factor. We apply this to the area change on the local plane due to velocity.

Recall

$$\left(\left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t) - \Psi(r,t)\right) + \frac{\left(\frac{p}{\rho}\right)}{c^2}\Psi(r,t)\right)^{Local}$$

Applying the value we get

$$\left(\mu * \left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t) - \Psi(r,t)\right) + \frac{\left(\frac{p}{\rho}\right)}{c^2}\Psi(r,t)\right)_{Local}$$

This is the same as the Laplacian. Breaking it out we show.

$$\mu\nabla^2 v = \mu * \left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t) - \Psi(r,t)\right)$$

1.43 Heat in a Fluid

In Pi-Space, heat in a fluid is on the local plane where the particles are. In order to map to Pi-Space we need to determine what the effect of Temperature on the wave function is.

The ideal gas law shows us the relationship.

$$pV = nRT$$

Volume stays the same so we see that increased pressure causes increased temperature. A larger pressure maps to a larger Pi-Shell diameter so therefore we add this temperature value to the local plane diameter.

We consider the use of Boltzmann's Constant k

$$pV = nkT$$

We want the change in temperature so we can use Fourier's Law of Heat

$$q = k\nabla T$$

In this case, k is the material's conductivity. **Note that the thermal laws show that heat moves from higher temperature to a lower temperature. This maps to a Pi-Shell moving from a larger wave location to a lower wave location. This is the same principle for plane wing movement.**

Let's consider the local plane once more.

$$\left(\left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t) - \Psi(r,t)\right) + \frac{\left(\frac{p}{\rho}\right)}{c^2}\Psi(r,t)\right)_{Local}$$

We add temperature which is an addition, namely larger temperature means larger wave length and larger Pi-Shell, so we obtain the following form.

$$\left(\left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t)-\Psi(r,t)\right)+\frac{\left(\frac{p}{\rho}\right)}{c^2}\Psi(r,t)+k\frac{(\nabla T)}{c^2}\Psi(r,t)\right)_{Local}$$

Using a Prandtl number for modeling temperature we would get a form like

$$\left(\left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t)-\Psi(r,t)\right)+\frac{\left(\frac{p}{\rho}\right)}{c^2}\Psi(r,t)+\frac{1}{R_e}\frac{1}{\Pr}\frac{(\nabla T)}{c^2}\Psi(r,t)\right)_{Local}$$

Either way the idea is to apply a scaling factor to the temperature delta to change it into an area change and subsequent wave function change.

1.44 The Continuity Equation

The Continuity equation is a conservation law. There is conservation of mass, momentum and energy.

$$\frac{v^2}{2}+gz+\frac{p}{\rho}=const$$

We have two locations so there must be conservation. Let's assume gravity and density is a constant.

$$\frac{{v_1}^2}{2}+\frac{p_1}{\rho}=\frac{{v_2}^2}{2}+\frac{p_2}{\rho}$$

This is the formula that describes why pressure drops and velocity increases using Classic Logic. (Even folks who explain it have difficulty explaining why it makes sense.) I've already explained the connection between pressure and velocity in terms of wave function and Pi-Shell diameter. This is the missing piece in this formula according to the Pi-Space Theory and this is why it works intuitively. If this is unclear, see previous section of Bernoulli. Lets take the case of a Pi-Space continuity equation where we have m1, p1, v1,wave1 and m2,p2,v2,wave2.

So, in Pi-Space, we have gain and a loss of area (energy).

$$AreaLoss = \left(\rho * \left(Cos\left(ArcSin\left(\frac{v_1}{c} \right) \right) \Psi^1(r,t) - \Psi^1(r,t) \right) \right)$$

And

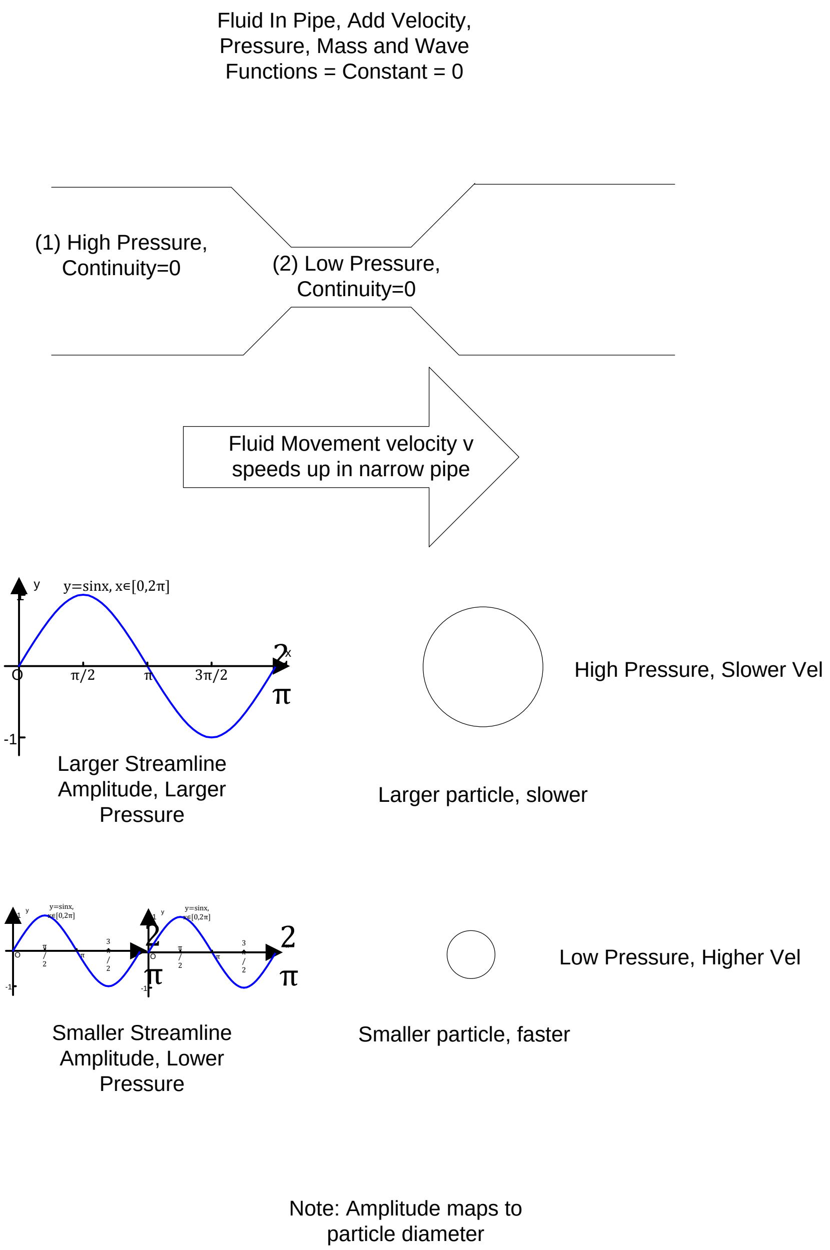
$$AreaGain = \left(\frac{\left(\frac{p_1}{\rho} \right)}{c^2} \Psi^1(r,t) \right)$$

They are equal and opposite to one another.

$$\left(\left(Cos\left(ArcSin\left(\frac{v_1}{c} \right) \right) \Psi^1(r,t) - \Psi^1(r,t) \right) + \frac{\left(\frac{p_1}{\rho} \right)}{c^2} \Psi^1(r,t) \right) = const = 0$$

Therefore

$$\left(\left(Cos\left(ArcSin\left(\frac{v_1}{c} \right) \right) \Psi^1(r,t) - \Psi^1(r,t) \right) + \frac{\left(\frac{p_1}{\rho} \right)}{c^2} \Psi^1(r,t) \right) = \left(\left(Cos\left(ArcSin\left(\frac{v_2}{c} \right) \right) \Psi^2(r,t) - \Psi^2(r,t) \right) + \frac{\left(\frac{p_2}{\rho} \right)}{c^2} \Psi^2(r,t) \right)$$



One can see from this equation that there is conservation of mass, velocity and energy (which is area change). Typically, mass m1 = m2 where there is no change in density due to an incompressible fluid. Mass m1 may not be equal to mass m2 where the fluid is compressible.

So if we have a change in velocity and pressure, we have a change in the quantum wave function as well.

Let's see how this conservation principle applies to Navier Stokes.

$$\frac{\partial \rho}{\partial t} - \nabla.(\rho v) = 0$$

If we have a compressible fluid then the density changes. This maps to a change in the mass of the chosen area.

Let's say that the fluid is incompressible, we get

$$\nabla . v = 0$$

This is the divergence. In previous sections I explained that the divergence is the area change due to movement or pressure or mass. Therefore, the total area change going in is the same as the total area change going out. Area maps to energy. Each Pi-Space Quantum equation sums up to 0. The way to understand this is that certain effects add to a Pi-Shell diameter and some subtract from the Pi-Space diameter. Namely, velocity and acceleration are a subtraction. So far, pressure, potential energy and temperature are a gain. So we can say for any plane we have a sum of zero area change.

$$\nabla . v = 0 = \left(\left(Cos\left(ArcSin\left(\frac{v}{c} \right) \right) \Psi(r,t) - \Psi(r,t) \right) + \frac{\left(\frac{p}{\rho} \right)}{c^2} \Psi(r,t) \right)_{Local}$$

The same is true of the non Local plane or even an EM one.

If we add in the idea of a compressible fluid, what this means is that the mass density is varying with respect to time and this is handled by the mass m in the equation.

$$\frac{\partial \rho}{\partial t} - \nabla . (\rho v) = \left(\left(Cos\left(ArcSin\left(\frac{v}{c} \right) \right) \Psi(r,t) - \Psi(r,t) \right) + \frac{\left(\frac{p}{\rho} \right)}{c^2} \Psi(r,t) \right)$$

1.45 Pitot Static Tube

Let's show how to do an example using the Pi-Space formula where we solve for velocity v. Pressure is an area gain and velocity is an area loss so we place them equal and opposite to one another. In a plane, we can solve for a velocity v based on pressure.

Pitot formula is

$$p_t = P_s + \left(\frac{\rho v^2}{2} \right)$$

Pt is stagnation or total pressure
Ps is static pressure
And Rho is fluid density

Then we can solve for v

$$v = \sqrt{\frac{2(p_t - P_s)}{\rho}}$$

Let's solve this using Pi-Space

$$\left(\frac{\left(\frac{Pt}{\rho}\right)}{c^2}\Psi^1(r,t)\right) = \left(\left(Cos\left(ArcSin\left(\frac{v_2}{c}\right)\right)\Psi^2(r,t) - \Psi^2(r,t)\right) + \frac{\left(\frac{Ps}{\rho}\right)}{c^2}\Psi^2(r,t)\right)$$

The wave function is the same so this cancels.

$$\frac{\left(\frac{Pt}{\rho}\right)}{c^2} = \left(\left(Cos\left(ArcSin\left(\frac{v_2}{c}\right)\right) - 1\right) + \frac{\left(\frac{Ps}{\rho}\right)}{c^2}\right)$$

Which is the same as

$$\frac{\left(\frac{Pt}{\rho}\right)}{c^2} = \frac{\left(\frac{Ps}{\rho}\right)}{c^2} + \left(Cos\left(ArcSin\left(\frac{v_2}{c}\right)\right) - 1\right)$$

And

$$\left(Cos\left(ArcSin\left(\frac{v_2}{c}\right)\right) - 1\right) = \frac{\left(\frac{Pt}{\rho}\right)}{c^2} - \frac{\left(\frac{Ps}{\rho}\right)}{c^2}$$

Solving for v, we recall how it was done for Escape velocity for a planet in the Advanced formulas.

$$\frac{v}{c} = Sin\left(ArcCos\left(1 - \frac{\left(\frac{GM}{r}\right)}{c^2}\right)\right)$$

To get back a Newtonian velocity we need to multiply by C

$$v = Sin\left(ArcCos\left(1 - \frac{\left(\frac{GM}{r}\right)}{c^2}\right)\right) * c$$

Which is the same as

$$v = Cos\left(ArcSin\left(1 - \frac{\left(\frac{GM}{r} \right)}{c^2} \right) \right) * c$$

Therefore, our Newton velocity solution for the Pitot Static tube is as follows. The benefit of this is that the result is relativistic according to the Pi-Space Theory.

$$v = Cos\left(ArcSin\left(1 - \frac{\left(\frac{Pt - Ps}{\rho} \right)}{c^2} \right) \right) * c$$

For solutions where v << C and v < C

So

$$v = Cos\left(ArcSin\left(1 - \frac{\left(\frac{Pt - Ps}{\rho} \right)}{c^2} \right) \right) * c = \sqrt{\frac{2(p_t - P_s)}{\rho}}$$

For solutions where v << C

1.46 Pitot Sample Calculation in Pi-Space

Let’s do a simple calculation to solve for velocity knowing pressure. In Pi-Space, Energy is an area loss of a Pi-Shell. Velocity is a diameter line change.

Pressure is an energy calculation and is therefore an area loss.

We use an imperial system example

Where we have PSI

Let’s take an example where the dynamic pressure is 1.040 lb/ft^2

Also the density of air is 0.002297 slug/ft^3

Using the classic formula, Using Mathematica

Sqrt[2∗(1.04)/(0.002297)] = 30.092 ft/s

Now let's use the Pi-Space formula

This formula requires that we use the speed of light in feet per second

the speed of light = 983,571,056 foot per second

Sin[ArcCos[1 - (((1.04)/(0.002297))/(983571056^2))]]*983571056 = 29.3127

Now we can see this is not the same as the Classical Result.

The Pi-Space Theory maintains that this is a "more accurate" result than the classical approach.

The Classical Approach is just an approximation.

Let's make Pi-Space match the Classical approach.

For the speed of light, we set it to 9835710 foot per second (incorrect) instead of 983571056 foot per second

Sin[ArcCos[1 - (((1.04)/(0.002297))/(9835710^2))]]*9835710 = 30.092

Therefore, the more accurate the speed of light calculation, the more accurate the Pitot Velocity result in the Pi-Space Theory.

Note: This would have to be proven/disproven by actual experimentation. I do not have the equipment for this.

Here is a table showing the range of values which are approximate to one another.

```
Table[Sin[
  ArcCos[1 - (((psi)/(0.002297))/(983571056^2))]]*983571056, {psi, 1,
  30, 1}]

{29.3127, 41.4544, 50.7711, 58.6254, 65.5452, 71.8012, 77.5541, \
82.9088, 87.9381, 93.8464, 98.3178, 102.594, 106.7, 110.653, 114.47, \
118.163, 121.745, 125.224, 128.609, 131.907, 135.125, 138.268, \
141.341, 144.348, 147.295, 150.183, 153.017, 155.799, 159.209, \
161.885}
```

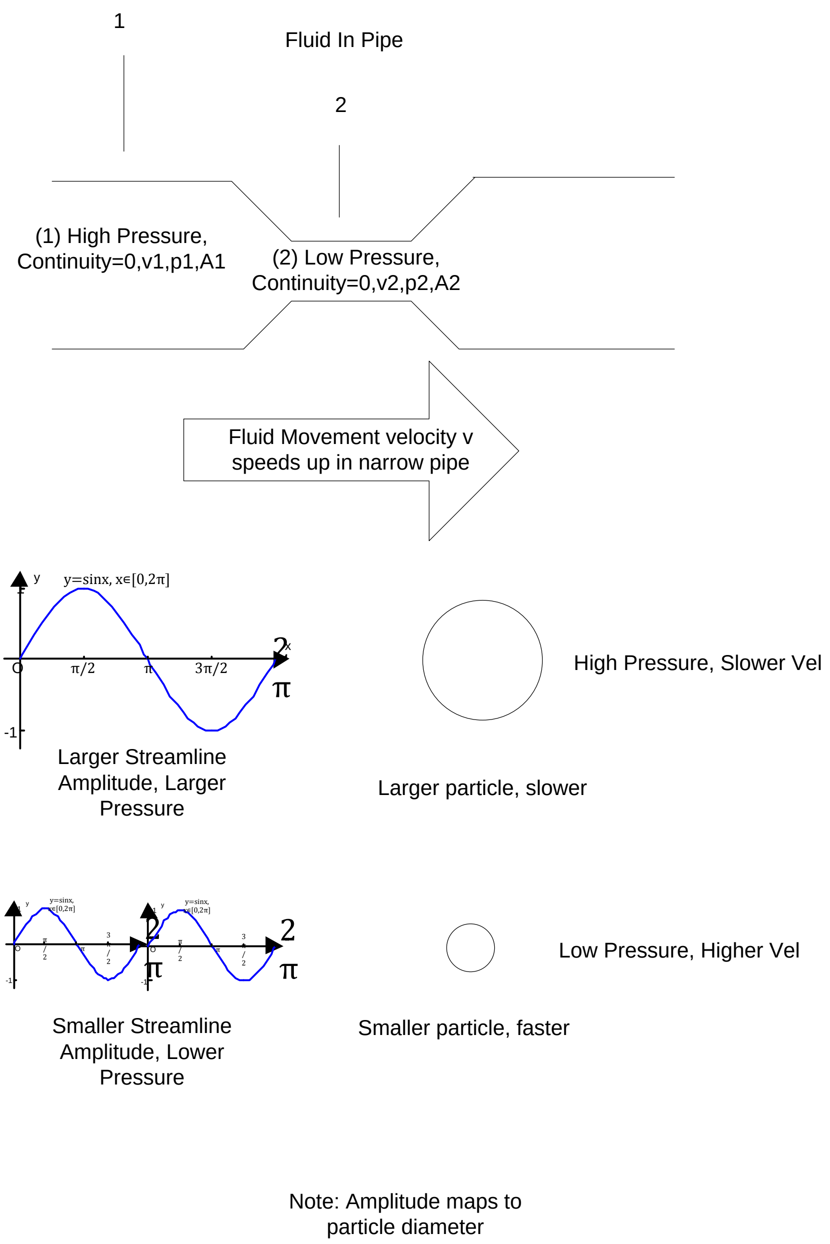
```
Table[Sqrt[2*(psi)/(0.002297)], {psi, 1, 30, 1}]

{29.5076, 41.7301, 51.1087, 59.0153, 65.9811, 72.2787, 78.0699, \
```

83.4602, 88.5229, 93.3114, 97.8658, 102.217, 106.391, 110.407, \
114.283, 118.031, 121.663, 125.19, 128.621, 131.962, 135.221, \
138.403, 141.514, 144.557, 147.538, 150.46, 153.326, 156.14, 158.904, \
161.62}

1.47 Venturi Flow in Pi-Space

Let's show how to model Venturi Flow using the Pi-Space formula where we solve for velocity flow. The Venturi Flow Formula demonstrates how we can model the flow going through a narrow constriction.



In this case, the wave amplitude decreases in area A2 compared with area A1 and this causes the particles to speed up. There is a relationship between the area A1 and the wave function and A2 and the wave function as well. If A1 becomes smaller, then the wave amplitude decreases.

$$A_1 \propto \Psi^1$$

And

$$A_2 \propto \Psi^2$$

Also Flow Q = VA is a constant.

$$V_2 A_2 = V_1 A_1$$

Modeling this in Pi-Space we get

$$\left(\left(Cos\left(ArcSin\left(\frac{v_1}{c} \right) \right) \Psi^1(r,t) - \Psi^1(r,t) \right) + \frac{\left(\frac{p_1}{\rho} \right)}{c^2} \right) = \left(\left(Cos\left(ArcSin\left(\frac{v_2}{c} \right) \right) \Psi^2(r,t) - \Psi^2(r,t) \right) + \frac{\left(\frac{p_2}{\rho} \right)}{c^2} \right)$$

Let's place pressure on one side and Kinetic Energy on the other. We focus on the wave function change due to the changing area.

$$\frac{\left(\frac{p_1}{\rho} \right)}{c^2} - \frac{\left(\frac{p_2}{\rho} \right)}{c^2} = \left(Cos\left(ArcSin\left(\frac{v_1}{c} \right) \right) \Psi^1(r,t) - \Psi^1(r,t) \right) - \left(Cos\left(ArcSin\left(\frac{v_2}{c} \right) \right) \Psi^2(r,t) - \Psi^2(r,t) \right)$$

Solving like Pitot for velocity and Escape velocity, we get a similar result but we have a wave function now. The changing wave function alters mass density. In this case, mass density is relatively larger in A1 due to higher wave function amplitude and therefore, velocity is lower. Notably, interpreting this in Pi-Space, the volume increases.

$$Q = A_1 * Cos\left(ArcSin\left(1 - \frac{\left(\frac{P_1 - P_2}{\rho\left(\left(\frac{\Psi^1(r,t)}{\Psi^2(r,t)} \right)^2 - 1 \right)} \right)}{c^2} \right) \right) * c$$

However, we don't have a measurable wave but an area so we use this as they are proportional.

$$Q = A_1 * Cos\left(ArcSin\left(1 - \frac{\left(\frac{P_1 - P_2}{\rho\left(\left(\frac{A_1}{A_2}\right)^2 - 1\right)}\right)}{c^2}\right)\right) * c$$

Also for A2 we get

$$Q = A_2 * Cos\left(ArcSin\left(1 - \frac{\left(\frac{P_1 - P_2}{\rho\left(1 - \left(\frac{A_2}{A_1}\right)^2\right)}\right)}{c^2}\right)\right) * c$$

1.48 Navier Stokes For Momentum and Energy

Let's derive a Navier Stokes for energy and momentum for an incompressible flow.

$$\frac{\partial u}{\partial t} + u.\nabla u = -\frac{1}{d}\nabla p + \nu\nabla u + f$$

Pi-Space functions are by default Energy Equation. Let's keep it in the original Pi-Space format initially to show all the detail.

On the right hand side of the equation, we have pressure and Gravity

Continuity applies to both planes (they add up to zero).

$$\left(\left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t)-\Psi(r,t)\right)+\frac{\left(\frac{p}{\rho}\right)}{c^2}\Psi(r,t)\right)^{Local}\left(\rho*\left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t)-\Psi(r,t)+\frac{\left(\frac{GM}{r^2}\right)h}{c^2}\Psi(r,t)\right)\right)^{NonLocal} *$$

Let's combine these planes as they can be added together. They both change the diameter of the particle(s) in question.

$$\left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t)-\Psi(r,t)\right)+\frac{\left(\frac{p}{\rho}\right)}{c^2}\Psi(r,t)+\frac{\left(\frac{GM}{r^2}\right)h}{c^2}\Psi(r,t)$$

Let's add temperature

$$\left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t)-\Psi(r,t)\right)+\frac{\left(\frac{p}{\rho}\right)}{c^2}\Psi(r,t)+\frac{\left(\frac{GM}{r^2}\right)h}{c^2}\Psi(r,t)+k\frac{(\nabla T)}{c^2}\Psi(r,t)$$

Let's add viscosity

$$\mu*\left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t)-\Psi(r,t)\right)+\frac{\left(\frac{p}{\rho}\right)}{c^2}\Psi(r,t)+\frac{\left(\frac{GM}{r^2}\right)h}{c^2}\Psi(r,t)+k\frac{(\nabla T)}{c^2}\Psi(r,t)$$

This gives us the total energy change for a point in a velocity field (excluding a turbulence factor).

$$\frac{\partial u}{\partial t}+u.\nabla u=\mu*\left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t)-\Psi(r,t)\right)+\frac{\left(\frac{p}{\rho}\right)}{c^2}\Psi(r,t)+\frac{\left(\frac{GM}{r^2}\right)h}{c^2}\Psi(r,t)+k\frac{(\nabla T)}{c^2}\Psi(r,t)$$

Turbulence is on a different plane, so we break it out.

Let's assume the flow is in the xy direction and the turbulence is in a circular plane around the yz axis.

However, both generated turbulence and flow velocity are due to the changes at that point.

Therefore we get two equations to solve at each point

Flow xy area/energy

$$\frac{\partial u}{\partial t}=\mu*\left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t)-\Psi(r,t)\right)+\frac{\left(\frac{p}{\rho}\right)}{c^2}\Psi(r,t)+\frac{\left(\frac{GM}{r^2}\right)h}{c^2}\Psi(r,t)+k\frac{(\nabla T)}{c^2}\Psi(r,t)$$

Generated Turbulence yz area/energy

$$u.\nabla u = \mu * \left(Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t) - \Psi(r,t)\right) + \frac{\left(\frac{p}{\rho}\right)}{c^2}\Psi(r,t) + \frac{\left(\frac{GM}{r^2}\right)h}{c^2}\Psi(r,t) + k\frac{(\nabla T)}{c^2}\Psi(r,t)$$

The equation on the right is a Hamiltonian, so we can solve for velocity.

$$\mu * \left(\Psi(r,t) - Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t)\right) = \frac{\left(\frac{p}{\rho}\right)}{c^2}\Psi(r,t) + \frac{\left(\frac{GM}{r^2}\right)h}{c^2}\Psi(r,t) + k\frac{(\nabla T)}{c^2}\Psi(r,t)$$

Bring viscosity/Reynolds to the other side

$$\left(\Psi(r,t) - Cos\left(ArcSin\left(\frac{v}{c}\right)\right)\Psi(r,t)\right) = \frac{\left(\frac{p}{\mu\rho}\right)}{c^2}\Psi(r,t) + \frac{\frac{\left(\frac{GM}{r^2}\right)h}{\mu}}{c^2}\Psi(r,t) + \frac{\frac{k}{\mu}(\nabla T)}{c^2}\Psi(r,t)$$

Let's solve for velocity at each point first, for the velocity field.

The result can be applied to both the Flow formula and the Turbulence formula individually as this affects both planes. Recall that Turbulence is disturbance in the Gravity field and the velocity flow is a local Pi-Shell / particle effect in the direction of movement.

We drop the wave function assuming it's constant at this point. Please recall how geometry affects the wave function for the Venturi example. Note that we apply a factor to the mass density similar to Venturi.

If we have an area loss the general form is

$$v = Sin\left(ArcCos\left(1 - \frac{\left(\frac{p}{\mu\rho}\right)}{c^2} - \frac{\frac{\left(\frac{GM}{r^2}\right)h}{\mu}}{c^2} - \frac{\frac{k}{\mu}(\nabla T)}{c^2}\right)\right) * c$$

We can simplify Gravity

$$v = Sin\left(ArcCos\left(1 - \frac{\left(\frac{p}{\mu\rho}\right)}{c^2} - \frac{\frac{gh}{\mu}}{c^2} - \frac{\frac{k}{\mu}(\nabla T)}{c^2}\right)\right) * c$$

So we get Flow velocity at the point on the xy plane is

$$FlowVelocity = Sin\left(ArcCos\left(1 - \frac{\left(\frac{p}{\mu\rho}\right)}{c^2} - \frac{\frac{gh}{\mu}}{c^2} - \frac{\frac{k}{\mu}(\nabla T)}{c^2} \right) \right) * c$$

Generated Turbulence is a vortex in the yz plane with FlowVelocity v. Radius r of vortex expands outward at v*t and has rotational energy a= v^2/r which dissipates. (This affects neighboring particles – for now we leave this out.)

$$TurbulenceVelocity = Sin\left(ArcCos\left(1 - \frac{\left(\frac{p}{\mu\rho}\right)}{c^2} - \frac{\frac{gh}{\mu}}{c^2} - \frac{\frac{k}{\mu}(\nabla T)}{c^2} \right) \right) * c$$

I will cover Turbulence is more detail in a later section but this is the initial reworking of the Navier Stokes into Pi-Space.

Note that we need to factor in the third-party Turbulence as well from other point sources. Therefore, if there are none or they are small we have a **laminar or smooth** solution where the flow velocity is reasonably constant. If the remote sources of Turbulence are large, then we get a **Turbulent flow**. I will cover this next by factoring this in. For now, this is enough.

1.49 Adding External Turbulence to Navier Stokes

External turbulence can be present on any of the three axes x,y and z. To calculate it, one needs to understand the shape of the object in question which is a limiting factor. Around a plane wing, it is a growing vortex. However, another plane for example may fly into this "wash". From the earlier derivation we can calculate the turbulence at a point. The next step is to add them all together for each point. Turbulence is a field effect therefore it should be calculated first. The rule of thumb is if one has a calculation involving particles and fields, then calculate the field first.

Pi-Space Rule of Thumb: The Field Comes First!

The reason is that field effects are non-local. So a Gravity field is always in place before particle movement. As Turbulence is a field effect disturbance, we calculate it first for all the points.

So the high level algorithm sequentially is

1. Calculate the Total Turbulence for all the points at time t = Total Gravity Disturbance Field effect (Sum of Turbulence Velocity at each point)
2. Calculate the velocity flow which includes turbulence from [1] => Particle + Field Effect
3. Goto 1 for time t+delta t

Therefore, we can model external turbulence as TotalTurb on the x, y and z axis.

So we add this to the Velocity Flow.

For xy,yz and zx axis e.g.

$$FlowVelocity_{xy} = Sin\left(ArcCos\left(1 - \frac{\left(\frac{p}{\mu\rho}\right)}{c^2} - \frac{\frac{gh}{\mu}}{c^2} - \frac{\frac{k}{\mu}(\nabla T)}{c^2} - \frac{ExtTurb}{c^2} \right)\right) * c$$

Add up all three axes using vector algebra and get the new vector for this point in the fluid.

Therefore, if TotalTurb > pressure, gravity and temperature on a different axis for example we'll have a Turbulent flow because the particle will change direction.