Quantum Relativity

from Cosmology Architecture to Chromodynamics

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https://www.spacetelescope.org/images/potw1612a/.

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Introduction

The more success the quantum theory has, the sillier it looks.

—Einstein, May 20, 1912
to Heinrich Zangger

We want to start by thanking our critics….

Cosmology is the structure we use to put all our scientific investigations in a working order and find our own place in the universe. It is vital to scientific integrity and the sustainability of society. It is not meant to be known like religion, but we can understand by enabling diverse expertise.

Cosmology is a quantum complex of contexts and nuances. It does not fit in any matchbox, children's story, or even the deepest line of theory. We are not here to bash or throw out any working theory including Big Bang Theory. All these must work together in an architecture or fail alone.

The architecture here depends heavily on the workings of Thermodynamics, quantum field theory, and chromodynamics (QCD)—the Standard Model of strong particle interactions since 1972.[1] This dependence in no way is an exclusion or to give rank. Each thing has its place. These things just happen to stitch others together in workable forms.

To solve evolved problems we need evolved thinking, language, and concepts. While we purposefully slow and cite the backgrounds going into the thinking, it is vital to pay close attention to our definitions, and take seriously words we fairly pillaged from fiction for their concepts. We are explicit with evolving cause. Never assume you already understand.

Outline Summary

Creation-ish

We step out of the Big Bang matchbox into the fire with a narrative outlining an even bigger bang within which the Big

[1] Fritzsch, H. (Sep. 27, 2012). The History of QCD. cerncourier.com/cws/article/cern/50796.

Bang emerged. An OSI-like architecture is introduced to help organize established understandings into a comprehensive working theory. We then begin to examine the deepest concepts of this system so the reader has a general idea of its workings.

Void Basics

A long chapter on literal nothing. The universe uses points in spacetime to spread disorder and cause all work from the lowest level up. We examine the implications of CMBR on galaxies, and how this muddies our ability to know in the deep field. Distance functions are examined, explained, and shown how they are applied to give us a range of useful information.

We observe redshift z=1 is practically next to z=24,486.4—where wavelength flat-lines. The reason is resistance to void expansion, not dilation or Minkowski. We also observe the adaptation factors are applied twice in the lookback distance function designed to squeeze the universe into Lemaître's matchbox.

Creating Singularities

Where Einstein's geodesics become indistinguishable, a juxtaposition occurs. One manifold enfolds the other manifold, which unfolds to all points of void in real time (phase). That value is CMBR. The fields are classified chromodynamically and evaluated for a broad range of interactions including the strong interactions responsible for time, CMBR, evolving matter, and galactic processes.

Change Functions

Tessarines, quaternions, and Boolean logic are explored to unveil a system of change as imaginary, complex, and hypercomplex functions. The concepts are then illustrated in a variety of contexts to clarify how the logic works algebraically and graphically. QCD color association and truth reveal the process of virtual emerging through interaction into real (relativistic).

Quantum Forces

Scalar energies at the root of all valuation derive easily from Fleming's rules. They transfer in wave form mechanically and electromagnetically. Quantization creates new virtual matter that must confine in interaction or annihilate. In interaction, the spaces are sequentially created and shaped as value of microstates flows through. The mass problem is easily seen as an array of elements contributing in degrees.

Constructing Spacetime

Euler provides the foundation to evolve change functions as linear values into surfaces, interactions into volumes, and establish the Laplacian. All apply simultaneously in different contexts. Change function axes provide sequence, direction, and shape to points. We then use Lie concepts to group, manipulate, and derive basic interactive field definitions.

Quantum Morphology

The hierarchy of life provides a similar sequence for matter. The evolution of six strong interaction types follows this plot through to hadronization and nucleon interactions to form isotopes. The plot simplifies into a three act play: virtual particles, unbound identities, and weak confinement. We put Weyl fermions and Fermi surfaces to good use winding the maze of complex interactions to understand weak interactions, mass, and much more.

Instantiation

New matter creation is a potential of the first type of strong interaction. Again we must turn to biology for terms like mitosis, meiosis, and evolutionary processes not accounted for in physics. Inadequate language makes finding information in physics so difficult that even experts get lost and confused, wasting time with wrong questions like baryonic asymmetry. Schrödinger and eigenfunctions help normalize, oscillate, and ultimately confine the details making matter do what it does.

Relative Field Theory

The evolution of relative fields starting with the initial quantum gravity brane. Einstein’s brane curves spacetime into the geodesic definition and shows multiple paths to singularity. His geodesic equation is two branes interacting to form a third, which is the spatial action of gravity.

We refine the GFE to show its boundaries, conversion through Poisson-Gauss into momentum and acceleration. This reveals ambiguities like the electroweak field, microgravity, and the continuation generally without limits. Recognizing the context and definition of the electroweak field shows how CP-violation applies, how microgravity emerges, and how GRACE maps gravitational anomaly.

Confined Morphology

Atoms are the final stage of renormalization. Nucleons, electrons, and their interactions still have quantum qualities being confined through renormalization into atoms. Nuclide structure is confined in a permittivity (Schwarzschild radius) with a degree of disorder providing an imaginary space of interactions.

From this imaginary manifold applied to a fixed density, intrinsic magnetic qualities and induction emerge. It also means much of our theories about nuclide structure are simultaneously true depending on context. A similar examination of electrons reveals a layer of confined complexity that can explain valence states, limits on the periodic table, and likely many more otherwise inexplicable concepts.

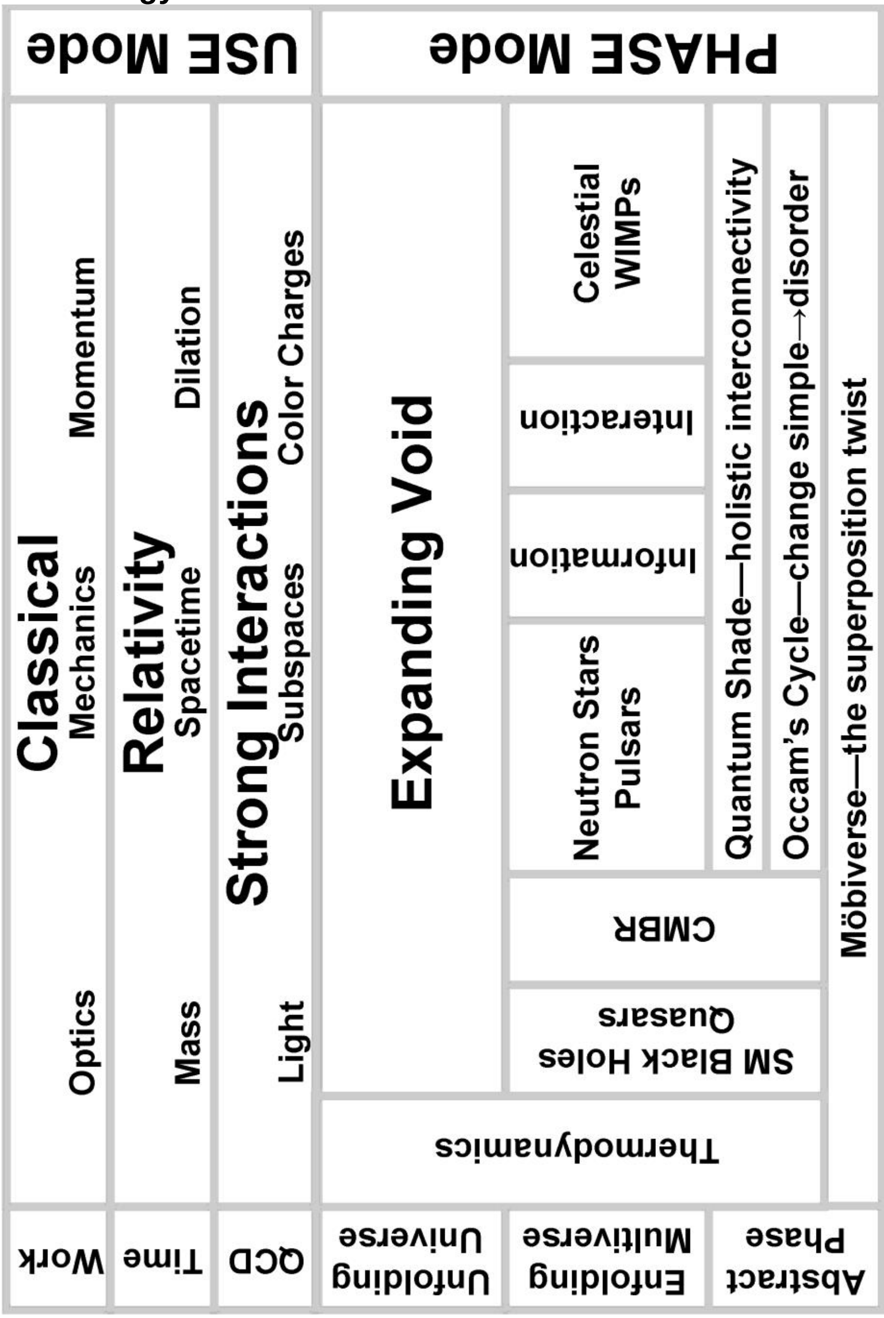
Confined Morphology

Cosmology

We are all agreed that your theory is crazy. The question that divides us is whether it is crazy enough to have a chance of being correct.

—Niels Bohr, 1958
to Wolfgang Pauli re: Heisenberg Uncertainty

Cosmology Architecture



Creation-ish

Once upon a time long long long ago…. Perhaps even longer ago….

A very special kind of black hole formed by fully occupying its surface and expelling its volume in one giant burst of light focusing around its equator and forming the first particles of the Milky Way (as a Lyman-alpha emitting galaxy).

Gravity contracted space around the poles of the black hole, drawing in the newly formed matter to form a bar-shaped spiral. It sucked all this matter and more slowly back into its volume. Some strongly interacted and became part of the black hole.

When something is lost forever to the black hole and similar objects, its value gets distributed to the entire universe as CMBR and expanding void. This is how gravity, strong interactions, and entanglement keep the universe and time going.

Every so often, the volume of the black hole fills up enough to cause another burst. Each burst contains light forming new matter like protons and electrons, and old matter evolving into massive WIMPs and heavy elements.

One such burst happened about 13.7 billion years ago, shaping the Milky Way and eventually our solar system and world as we know them today.

Perspective

Big Bang Theory (BBT) and Santa Claus have a lot in common. Both started as something real in a context. Both wormed their ways into the hearts of homes while everyone forgot the context. Both evolved to the level of fairy tale that can be conveyed by a four year old. Both have incredibly useful social, religious, and commercial values.

It is more socially acceptable to criticize BBT than Santa Claus unless you are in the scientific community. If you are in the scientific community, you can criticize Santa but not BBT. This would be fine if BBT were a compelling motivation like the pursuit of understanding. Instead, BBT is a simple and rigid storyline. The rigidity has come at odds with observational astronomy and quantum physicists the world over.[1]

Astronomers have become outright cynical about the conflicts between BBT and observations. Dr. Wright is stuck at a desk in the UCLA Astronomy Department. Within minutes of a press release, he gets an email to field questions like, “If a distant cluster of galaxies is 9.1 billion light years away in a universe that is 13.7 billion years old, how did the cluster get so far away in only 4.6 billion years?”[2]

Science is about understanding, not knowing. Lemaître, as a priest and source for BBT, in a way opened up a mindset of thinking science is like religion: about knowing. This is unhealthy. As Dr. Wright laments, we know exactly what we observe, which is the redshift information. Beyond that we enter the realms of speculation and hypothesis.

The real problem of BBT is the elephant in a matchbox.[3] Unlike the famous legal case, science has been trying to squeeze the elephant into the matchbox. The matchbox is itself fine. Like Darwin’s version of evolution, it may have some pre-adolescent awkwardness here or there, but generally speaking, the theory actually works and checks out.

We must give credit to the brilliance of BBT support. There are common excuses made like expansion of the universe, which is precisely why light permeates and what causes redshift in the first place. Even if they were separate matters, the BBT expansion is far greater than the speed of light, which is the rate of expansion. It’s alright. We will explain how all these things work, including adjusting distance concepts.

We will do all this by showing how things work with an architectural model. This means making all our matchboxes and other working systems into functional modules. Each module has its own contextual logic and definitions that work. We will not throw out definitions of logic solving problems to re-embrace the thinking that created those problems.[4]

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[1] NASA. (Apr. 16, 2010). Beyond Big Bang Cosmology. https://map.gsfc.nasa.gov/universe/bb_cosmo.html.

[2] Wright, E.L. (2013). Why the Light Travel Time Distance should not be used in Press Releases. http://www.astro.ucla.edu/~wright/Dltt_is_Dumb.html.

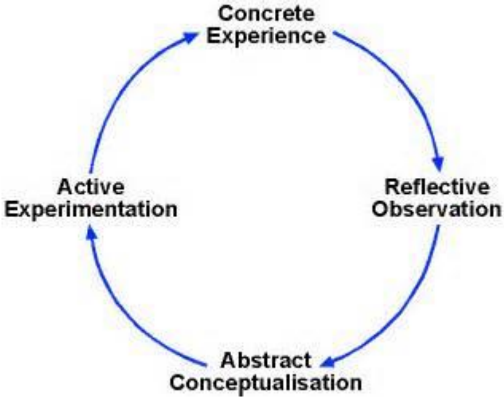
[3] Mapp v. Ohio, 367 U.S. 643 (1961).

[4] Einstein: “We can not solve our problems with the same level of thinking that created them.”

This approach enables us to apply all the rules all the time. It takes us out of the matchbox for problems outside the matchbox. It allows us to use observations without creatively engineering them to fit an ideology. It means we can be wrong about a part without the whole structure collapsing. It means we can evolve our understanding instead of marrying to a rigid ideology.

Architecture Methodology

The scientific method is a learning system (epistemology). These systems consistently follow a four step model and compound as diverse ideas are combined into common concepts. The model starts with concrete experiences.



[5]

Experiences are observed relative to the understanding we came into the process with. We then raise them to an abstract level where we can put them into context with unlike things. The abstract logic is itself diverse. When we put the logic into a structure of connectivity, we establish a conceptual theory.

A conceptual theory is always based on our best understanding of our logic. The logic includes such things as rules and mathematical formulas that provide predictable results. Put into a structure, new predictions can be made. We then induce the process forward in the scientific method.

We must be cautious with the scientific method. It traditionally tries to prove itself right, working learning backwards. This habit is one reason why science tries

[5] Kolb, D.A. (1984). Experiential Learning: experience as the source of learning and development. Englewood Cliffs, NJ: Prentice Hall.

squeezing elephants into matchboxes. Another reason is the incredible headache of actually doing something original. So long as you stay in the established model, you don't have to kill yourself proving it, and then spend a lifetime defending it.

Even in graduate school we are taught with our dissertation to play safe: that a significant contribution is nudging the established forward just a smidge. Any smidge can actually be very significant, like Relativity. This practice is actually reasonable from an epistemology perspective. You really need a lifetime of diverse learning and adverse experiences to safely make a seriously significant contribution.

The social sciences have a different approach. They are very aware of the effects of scientists on observations and subjects. To eliminate the ego and assure validity, they test a null-hypothesis to try and prove their theory wrong. The null-hypothesis is the opposite of the hypothesis in that it argues no correlative relationship between two measured phenomena or association among groups.[6]

If my hypothesis is that the Big Bang created the hydrogen atoms of the universe, my null-hypothesis says something to negate the hypothetical premise. I can say there is no correlation between a hypothetical Big Bang (what the argument is intended to prove) and creating hydrogen. If I look at evidence to support my hypothesis, I absolutely must accept a total lack of evidence supporting it too.

Lyman-alpha radiation (LAR) comes from hydrogen creation.[7] CMBR allegedly is Big Bang afterglow. No LAR has been observed in CMBR.[8] LAR is observed in our solar system and galaxy, so hydrogen is not just created one way.[9] The most efficient observed way to mass produce large quantities is in an LAE (emitting) galaxy.

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[6] Everitt, B. (1998). The Cambridge Dictionary of Statistics. Cambridge, UK New York: Cambridge University Press. http://www.stewartschultz.com/statistics/books/Cambridge%20Dictionary%20Statistics%204th.pdf.

[7] Draine, B.T. (2010). Physics of the Interstellar and Intergalactic Medium. Princeton, N.J.: Princeton University Press.

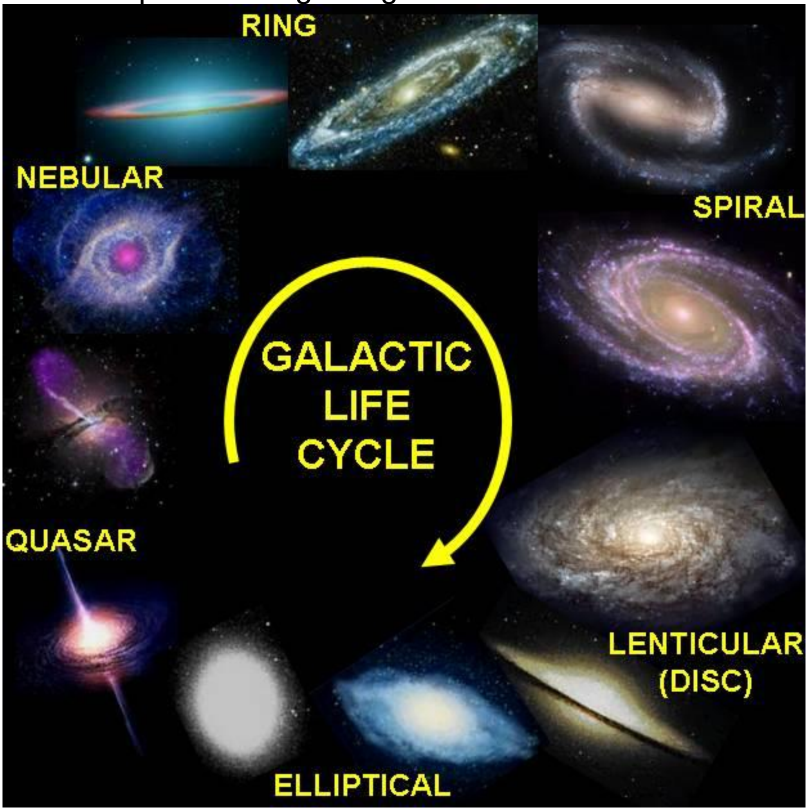
[8] Brown, M. (ca 2014). Cosmic Microwave Background. JodrellBank Centre for Astrophysics, Manchester University. http://www.jodrellbank.manchester.ac.uk/research/research-groups/cosmology/cosmic-microwave-background/.

[9] Castelvecchi, D. (Dec. 1, 2011). "Voyager Probes Detect "invisible" Milky Way Glow." National Geographic. https://news.nationalgeographic.com/news/2011/12/111201-voyager-probes-milky-way-light-hydrogen-sun-nasa-space/.

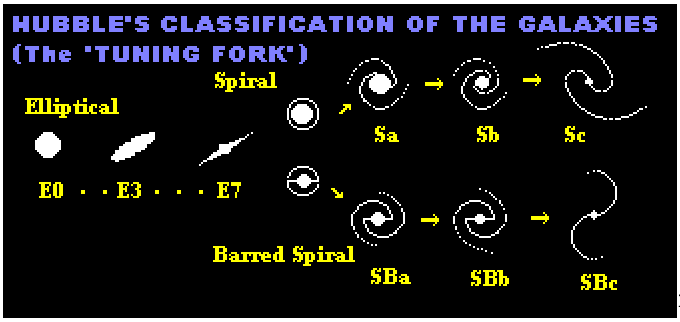
LAE is a type of early stage galactic development. We will show this process as a function of the field conditions resulting from creating a type of black hole. That function is a massive burst of energy focusing enough to forge a particle zoo. While consistent with BBT, the inconsistency is when.

From this zoo, protons and electrons naturally emerge and conjoin among other particles like neutrinos. When LAE's start forming stars they are called Lyman-break galaxies. Similar later bursts, like Lemaître's Big Bang, will produce rare Earth elements. His was definitely not this galaxy's first big bang.

The galactic cycle illustrated takes billions if not tens of billions of years depending on the scale. This of course does not include creating the black hole or later development eventually neglecting and killing the black hole. Hubble showed this process beginning with his 1926 classifications.[10]



[10] Hubble, E.P. (1927). Extra-galactic nebulae. Astrophysical Journal. aldebaran.cz/astrofyzika/struktury/galaxie/docs/Hubble-1926ApJ_64_321H.pdf.



[11]

Architecture

We do not live in a classical or relative universe. We live in a highly sophisticated quantum universe from which relative and classical things emerge. We are the end users of this system, skewing our view of its nature. Like every end user, we think what we see is what it is. Then we use a hammer to break open the box only to find the computer inside looks nothing like what we see in use.

On top of the physical system is a program-like architecture making it usable. Our first and most obvious architectural distinction is between our end-user perspective and the physical system. We will call the end-user portion our USE Mode, and the physical system our PHASE Mode.

Phase has many definitions in physics. One is "the position of a point in time (instant) on a waveform cycle."[12] Phase describes a moment of unspecified duration and all the change conditions fitting into that moment.

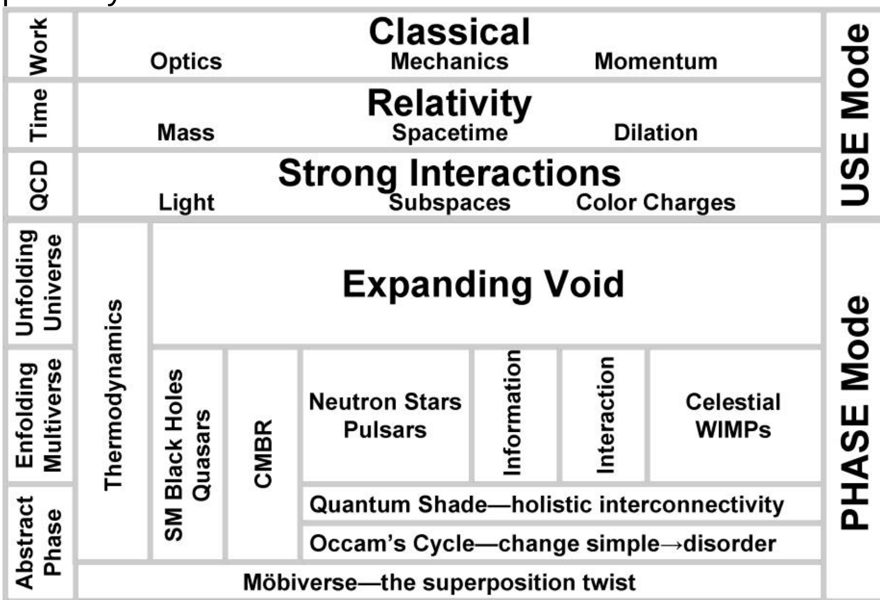
Time is resistance to change—a component concept of the USE Mode. Time derives from strong interactions in phase, such as interactions of entanglements as surfaces interacting with volumes of strong bonds.[13] It is not causal of phase. A permutation of phase points is a cycle.

"Kernel" is the computer science term for the PHASE Mode.[14] It is the part of an operating system in complete

[11] McNally, E. (Apr. 19, 2000). Hubble's Tuning Fork. Cornell University. http://www.astro.cornell.edu/academics/courses/astro201/galaxies/tunfrk.htm.
[12] Rouse, M. (Sept. 2005). "Phase." http://whatis.techtarget.com/definition/phase.
[13] Wolchover, N. (Apr. 16, 2014). Time's Arrow Traced to Quantum Source. https://www.quantamagazine.org/quantum-entanglement-drives-the-arrow-of-time-scientists-say-20140416/
[14] Yool, G.R. (2014). Practical Algorithms. 3 ed. pg 55.

control of the system. The system itself is technically inert without the USE Mode. That has nothing to do with the presence or absence of human observers. It has to do with the inefficiency and anomaly of the inert system that sets everything in motion doing what we consider efficient “work.”

Architecture is subject to evolution with understanding. The beauty of a system like this is that we can be wrong. Architecture is not a rigid answer. It is a rough way to solve problems. We are very vague, for example, about the interconnectivity of items in the USE Mode. This book is primarily focused on the PHASE Mode.



The first layer of PHASE Mode is labeled abstract because it is a breakdown of abstract concepts. None of these concepts are provable on this level by empirical testing. They are established on other levels as legitimate logic and solutions. The superposition twist, for example, combines the concepts of a Möbius strip with Schrödinger’s cat.

The cat is both dead AND alive until the box is opened revealing it is dead OR alive. Equally valid outcomes are both true until put into an observable context in which one must be true and the other false. The twist is done to Occam’s Cycle—the change relationship from singularity to disorder.

It is called Occam's for its simplicity, but it is actually pretty involved. Simplicity requires the universe always steer the path of disorder, but to do that, perfect disorder must switch places with singularity. That gives a sudden twist to the nature of everything in the entire universe.

This cycle of phase points with twist is not our familiar universe. It is a conceptual container making our universe possible—hence Mobiverse. The cycle is restricted by how the cycle evolves. This evolution is dependent upon concepts of Thermodynamics that connect the expansion of void with super massive black hole (singularity) growth and CMBR.

Value Redistribution

Quantum Shade is a scifi term.[15] It is used here to describe the entanglement/interconnectivity of singularities with void independent of time and space as all available points. This interconnectivity converts value changes enfolded[16] into every singularity separately to identical redistribution to all points in the unfolding universe.

This redistribution is simultaneous and depends on strong interactions. Time generally depends on strong interactions. This function is a fundamental component to the emergence of cosmic time and the ability of the USER Mode to function.

A singularity by itself cannot draw in light, but it can conditionally draw in smaller masses. Each singularity (ν=nu below) draws in value (Q) either through its poles or equator, then discharges (W) value through its equator (in bursts) or its poles (in streams). These discharges range from light to matter, both come into focus creating or evolving new matter.

mu at least = lesser m² in — Laplacian spacetime units — nu radial changes

$$\upsilon_\gamma = \frac{1-\eta}{h}\left(\mu_{n-1} = \frac{{m_{n-1}}^2}{\nu_n}\right)\left(\frac{\nabla^2}{t^2} = 2\pi c^2\left(\frac{\delta\frac{1}{2}R}{r} + \frac{\delta r}{\frac{1}{2}R}\right)\right)$$

upper magnitude singularity — ∫=Surface in Volume — ∫=V in S

thermodynamic efficiency $\eta = \dfrac{\delta W = PdV}{\delta Q = TdS}$ Ejected light & evolving matter / Energy of mass into singularity

Efficiency of discharge is a percent ratio η=W/Q. What is lost to strong interaction is thus the inefficiency $1-\eta$. This $1-\eta$

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[15] Dollard S. (Nov. 21, 2015). "Face the Raven." Dr. Who. BBC.
[16] Talbot, M. (1996). The Holographic Universe. London: Harper Collins.

part of the value of m put into ν changes the local radial values for the surface (R/2) and volume (r) of the singularity. Their change affects the magnitude of the local spacetime.

The spatial distribution in the spacetime is represented by a function called the Laplacian. A Lapacian operator is used to represent a subjective coordinate system—meaning you plug in the one that works for you. It also allows for uneven distribution of values.[17] The energy (E=hυ) map of value distribution in the strong interaction is irregular.

Dividing by Plank's constant converts energy to frequency: a light distribution. As the Laplacian suggests, the distribution is mapped on a surface. The equation further shows the surface is curved. The interior space of that surface is flat as it is defined by time. That means value is distributed to the radius in degrees relative to the direction of the surface map.

These concepts convert to chromodynamic fields: singularity=ν (red and cyan) and disorder=μ (blue and yellow). This is significant because μ is shaped by the sinusoidal change function ι, which is seen in CMBR patterns.

Let us not forget the enfolding multiverse and unfolding universe layers in the architecture. Singularities have limited ways to absorb and interact with value. The relevant singularities are large enough to interact independently with mass. Celestial WIMPs, neutron stars, and other minor singularities play minor roles in the enfolding universe. Super massive black holes, however, are definitely relevant.

Information and interaction are related and equally significant features of enfolding into an identity. New identities are defined by these, whereas existing identities force information and interaction changes. These enfolding features are vital to understanding how matter works on all levels.

Mathematical singularity is degeneration[18] from normal behavior and spatial definition. Singularity occurs in the field equations when the interacting geodesic manifolds become indistinguishable. They appear to reduce to one space acting as surface tension and enfolding the other space. The

[17] Grinfeld, P. (Feb. 12, 2017). What is the Laplacian? Philadelphia, PA: Drexel University & Lemma. Video at: https://www.youtube.com/watch?v=4J74tquQ7jU.

[18] Weisstein, E.W. (2018). Singularity. From MathWorld--A Wolfram Web Resource. http://mathworld.wolfram.com/Singularity.html

enfolded space is held constant (by the Schwarzschild radius typically) but not there, depending on your perspective.

This enfolding space can consume by means of strong interaction. We would like to think of these black holes as universes unto themselves, except there is a massive problem. The enfolded space unfolds in real time as our own universe. What changes the value of a singularity is reflected as CMBR and expansion of void—unfolding our universe. This is our present universe in this exact phase point.

Void is generically the difference between a whole and its parts. For the universe applying CMBR, void is all the available points. This includes available in degrees. A fully occupied space like that of a singularity is not part of void. ALL other material spaces, however, have degrees of available void. The reason void is not available in a singularity is rather obvious: the void in a singularity is the void of the universe.

Occam's Cycle

Occam's razor states that given two solutions with the same outcomes, the simpler is preferred.[19] If both are valid, then this principle should not exclude the alternatives. It is also used in argument: the reliability of a premise is inversely related to the number of assumptions. The more assumptions made, the more convoluted and less reliable the conclusion.[20]

We use Occam to describe the simplest possible path to solution. The universe satisfies this in many ways to include:

- Multifunctionality—Function is defined by context and multiple functions that can apply simultaneously. This also leads to indifference among quantum states. Partial Differential Equations is a system of unknown change variables.[21] PDE multifunctionality applies to variables and functions. Interpretations evolve with understanding.
- Putting Nothing to Use—The universe uses nothing in the literal sense of nothing being a thing, like an absent part of

[19] "Entities are not to be multiplied without necessity," J.Poncius (1639) in: Scotus, J.D. (1894 reprint) Opera Omnia, vol.15, p. 433a. Paris: Vives.
[20] Gibbs, P. & Hiroshi, S. (1996-97). What is Occam's Razor? University of CA Riverside. http://math.ucr.edu/home/baez/physics/General/occam.html.
[21] Grigoryan, V. (Dec. 2010). Partial Differential Equations. UC Santa Barbara. p 1. http://web.math.ucsb.edu/~grigoryan/124A.pdf.

a proportion, absorption lines on the spectrum, void as the difference between a whole and its parts, etc.[22]

- Forcing Variables—Squeezing things into spaces they otherwise wouldn't fit in, like variable spacetime, treating a letter as a number, or treating light as a virtual photon or a real photon as light.
- Path of Least Resistance—e.g. from high to low potential, but does not exclude other paths.[23] Everything functions by its definitions in such a way that nothing is ever actually consumed (Noether's theorem).[24] The universe essentially does nothing in the most spectacular and ambiguous way.
- Cycle as Identity—"The wave function for a given physical system contains the measurable information about the system."[25] A cycle permutation thus contains all the elements of definition for an identity. Identity, however, does not mean individuality.

The Occam's Cycle of the universe is the simplest means to establish all its parts and definition. The universe is a self-contained everything that wastes nothing. It is the perfect balance of yin-yang, intrinsic-extrinsic, absorption-emission, contraction-expansion.

Cyclic Functions

These concepts boil down to the initial field conditions of two color charge classes of matter in QR: red (ν=nu matter) and blue (μ=mu). This is also true for anti-red (cyan) and anti-blue (yellow).

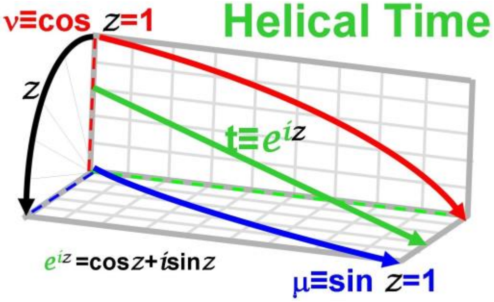
The colors originate in quantum chromodynamics (QCD), the Standard Model for strong interactions since 1972. We added the letter designations and swapped anti- for subtractive CMYK colors.

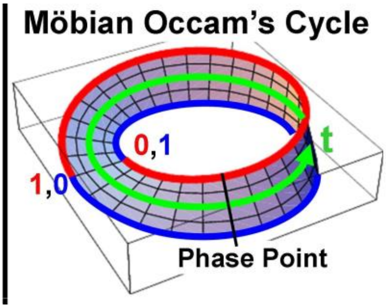
$$\frac{\text{Poisson's gravity}}{\text{Laplacian}}\ \frac{\nabla^2\Phi=4\pi G\rho}{\nabla^2} \Rightarrow \Phi_m=4\pi G\nu$$

[22] Weatherall, J.O. (2016). Void: The Strange Physics of Nothing. Yale University.
[23] Holt, M. (Jul. 1, 2001). The Path of Least Resistance. EC&M. Overland Park: KS. http://www.ecmweb.com/content/path-least-resistance
[24] Noether, E. (1918). Invariant Variation Problems. Nachr. D. König. Gesellsch. D. Wiss. Zu Göttingen, Math-phys. Klasse. pp 235–257.
[25] Nave, C.R. (2017). Eigenvalues and Eigenfunctions. Georgia State University. http://hyperphysics.phy-astr.gsu.edu/hbase/quantum/eigen.html

We can convert Einstein’s field equations to energy functions using the Poisson equation method[26] to compute nu (ν=Φ□/4πG). In the fundamental law of Thermodynamics, singularity occurs where S=0, δν=PdV/c², making δμ=TdS/c². The laws of Thermodynamics therefore define the phase moment (dU) in the Occam’s Cycle (below).

Expanding void is the idealization of mu, where singularity is the idealization of nu. The color charge associations are associations with quantum numbers. This makes these unit values: dm= (δμ=TdS/c²) – (δν=PdV/c²). The universe depends on inefficiency. This alone is too efficient. Inefficiency creeps in by means of δQ±δW.





Changes in pressure (P) and disorder (S) can describe either work (W) or energy going into a system (Q)—and they are split between the two sets of terms. Nothing specifically in TdS or PdV is exclusive to δQ or δW. We assume T goes into Q, but the energy entering the system could be intrinsic gravity and therefore not transferred like T.

There are several ways to write the function for deriving time from strong interactions like change in time occurs as increments of change occur between ȷ and ı: dt= δȷ + δı. Here we used Euler’s helix formula.[27] This formula is commonly used to rotate the y axis with the imaginary ı onto the x-plane resulting in a three dimensional space.[28]

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[26] Pe’er, A. (Feb. 17, 2014). Einstein’s field equation. Cork Ireland: University College. http://www.physics.ucc.ie/apeer/PY4112/Einstein.pdf.
Varnes, E. (2004). More on Gravitational Fields and Potential. University of Arizona. physics.arizona.edu/~varnes/Teaching/321Fall2004/Notes/Lecture20.pdf.
[27] Weisstein, E.W. (2018). Euler Formula. From MathWorld--A Wolfram Web Resource. http://mathworld.wolfram.com/EulerFormula.html.
[28] Joyce, D. (1999). Dave’s Short Course on Complex Numbers: Multiplying Complex Numbers. Clark University. www2.clarku.edu/~djoyce/complex/mult.html.

Time is commonly assumed to be the change radian. The change radian on Occam's Cycle follows the phase point, so we used z to indicate that abstraction. The logical change function of imaginary ɩ rotates phase relative to the time-emergent axis. It provides the sinusoidal twist/wave shape here and in the CMBR pattern. Time is set by expansion of void linking it directly with CMBR and Thermodynamic inefficiency (pg. 14).

Quantum Shade

Often we can use our architecture for clues on what a thing is doing. In computers this position is the microkernel, providing "the near-minimum amount of functions and features required to implement" operation.[29] The function in this position is to optimize operation by minimizing the required functions. Quantum Shade is holistic interconnectivity in and beyond time and space.

Observational astronomy shows galaxies at mixed stages of development at every redshift value. The ultra-deep field top includes a number of smudges deemed galaxies of various or unspecified developmental stages (e.g. CN-z11[30]) to a gamma burst.

Lyman-α galaxies occur in the full range of observations, even at redshifts practically next door (0.19 – 0.45).[31] These are new black holes and galaxies creating massive quantities of new particles and hydrogen. Suggestive irregularity and morphology changes increase with distance at least up to a redshift of 4.[32]

Surveys of clusters and galactic interactions suggest even greater ambiguities.[33] Such ambiguities we will refer to as

[29] Janssen, D. & Janssen, C. (2018). techopedia.com/definition/3388/microkernel.
[30] Newman, P. (Jul. 26, 2016). The Farthest Visible Reaches of Space. Goddard Space Flight Center. imagine.gsfc.nasa.gov/features/cosmic/farthest_info.html.
[31] Hayes, M. (2015). Lyman alpha Emitting Galaxies in the Nearby Universe. https://ned.ipac.caltech.edu/level5/Sept15/Hayes/paper.pdf.
[32] Conselice, C.J. (Jul. 21, 2004). The Galaxy Structure Redshift Relationship. https://ned.ipac.caltech.edu/level5/March04/Conselice/paper.pdf.
[33] Calvi, R. et al. (Nov. 15, 2011). The distribution of galaxy morphological types and the morphology–mass relation in different environments at low redshift. http://onlinelibrary.wiley.com/doi/10.1111/j.1745-3933.2011.01168.x/abstract.

instantiations—existing or having qualities due to a particular context. Observations suggest "A big ball of wibbly wobbly, timey wimey stuff"[34] Dr. Who concept fits quantum shade. It is as if we are looking into a kaleidoscope of interacting histories. Like the Hubble picture on the cover or below[35].

Speculation

The universe cheats. A primordial color charge must be confined (hidden).[36] Real photons consist of a color charge interacting with its reflection, confining in a time-neutral entanglement. One change function is used twice for one identity with significantly less energy than two would require. The energy doesn't sit still. It is swapped around among the parts and interactions in microstates. Basically what the universe does on a grand scale.

The history sequence we are looking at is relative in every sense of the term. Some of it is our history, but most is likely history from an array of perspectives including the future. Quantum Shade connects all voids to all singularities across the entire Occam's Cycle including all of time and space. That means our idea of NOW may not be the universe's.

Guan-wen, F. et al. (2016). Morphological Classification of High-redshift Massive Galaxies in the COSMOS/UltraVISTA Field. http://www.sciencedirect.com/science/article/pii/S0275106216300376.

[34] Moffat, S. (Jun 9, 2007). "Blink." Dr. Who.

[35] (Jul. 21, 2016). Space… the final frontier. ESA/Hubble Information Centre. https://phys.org/news/2016-07-space-frontier.html.

[36] Greensite, J. (2011). An Introduction to the Confinement Problem. Springer.

Void Basics

Void generically means: invalid (useless), completely empty space (unfilled or caused to be empty), empty (free from, lacking, vacant), or (in bridge and whist games) being dealt no cards of a particular suit.[1]

Our definition for void is the **difference between a whole and its parts**. For the universe, void would be **everything that isn't enfolded into its singularity parts**. Every other point is subject to the conditions of universal void. The degree of impact, however, is the cause for this chapter.

Expanding Void

In 1929, Hubble reported that distance accelerates objects away from us, concluding the universe is expanding.[2] Lemaître computed the universe to be expanding, which Hubble corrected using his information. At H_0 =500h Km/s Mpc, the universe is hardly expanding at all.[3] This constant is computed for general use by statistical inference of finite distance and local velocity information—$v=H_0$ D□ (see pg 29).

Supernovas and Cepheid variables help distinguish individual velocities up to about 400 Mpc (1.3 Gly).[4] Let us assume (incorrectly) these are perfectly reliable. These are unique, such that the "constant" is a measure of spacetime difference of a velocity-distance ratio. Combining as a general use number is a way to guesstimate.

The universe is like a giant pot filled with spaghetti being pulled apart. The energy of that action translates as momentum (p) resisted by the mass of the strands of interaction (/m) provides relative velocity (v).

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[1] (2017). Void. Oxford English Dictionary. en.oxforddictionaries.com/definition/void.
[2] Hubble, E.J. (Jan. 17, 1929). A Relation Between Distance and Radial Velocity Among Extra-Galactic Nebulae. Proceedings of the National Academy of Sciences. https://apod.nasa.gov/diamond_jubilee/1996/hub_1929.html.
[3] Livio, M. & Riess, A.G. (Oct. 2013). Measuring the Hubble Constant. http://physicstoday.scitation.org/doi/full/10.1063/PT.3.2148.
[4] Freedman, W.L. et al. (2000). Final Results from the Hubble Space Telescope Key Project to Measure the Hubble Constant. arxiv.org/pdf/astro-ph/0012376.pdf.

Resistance increases as you measure further down the strand from the action (e.g. from the ultimate limit of the universe). And this says nothing about the torsion holding the strands together, which rips itself apart in a reasonably short distance into observational history revealing the real problem.

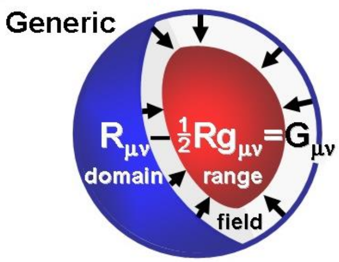
While we use conventional spaghetti as an example, the dimensions are definitely non-conventional. We can only reasonably apply this thinking locally. If we take any other perspective in the universe, the observer becomes superpositioned with analogous observations.

This quantum problem is incorrectly treated as conventional. It is really a Quantum Shade defying and defining all time and space problem. The field depth of our observations takes us through layers of evolving local to cosmic void. It also takes us through phase layers and a trans-historical mixed map. While we will certainly look at distance functions, let us focus on the mechanism of expansion.

Geodesic Field Equation (GFE)

$\mu\nu$	gC	Vector Symmetry	—	Red (presumptive)=gC'; Cyan=C'g
$R_{\mu\nu}$		Ricci (red=gC')	$/m^2$	Convergence/divergence per area =Volume Domain
$R_{\nu\mu}$		Ricci (cyan=C'g)		
R		Scalar curvature	$/m^2$	"Action" density range; circle 2r=R
$g_{\mu\nu}$	g_t	Metric (temporal)	—	Generic Phase shape
$G_{\mu\nu}$	G_t	Einstein (temporal)	$/m^2$	Emergent field generalized
Λ		Cosmological scalar	$/m^2$	Extrinsic Phase acting on intrinsic

* Deprecated due to Hubble. Added back in for environment.



Within Extrinsic Phase

$$R_{\mu\nu} - \tfrac{1}{2}R\, g_{\mu\nu} + \Lambda\, g_{\mu\nu} = G_{\mu\nu}$$

$$R_{(\mu\nu|\nu\mu)} - \tfrac{1}{2}R\, g_t + \Lambda\, g_t = G_t$$

Extrinsic spacetime density only modifies emerging relativistic fields, not quantum singularity.

Relativistic manifolds are constructed from a quantum level. A linear distance is just a magnitude until a radial change function evolves it into a circular surface. A manifold spacetime is created by change acting on a magnitude. Just as imposed change makes the linear magnitude circular, another imposed applies the circular surface to a volume.

The radius of the circular surface is half that of the volume it is applied to, explaining R/2. The metric tensor is Phase adding the required level of change needed to apply the surface to the volume. The interaction of these two manifolds defines the vector manifold of gravity.

Singularity occurs when the surface and volume manifolds become indistinguishable. This occurs when they have separately arrived at the limits they can use space. These limits are referred to as permittivity. The linear value is set by the Schwarzschild radius, where the angular volume value is set by $\acute{\varepsilon}_a=4\pi\varepsilon_0\ c^2$. We will return to this in detail later.

Point into Dimension

Void is a space function and spaces do things. Relativity is often described as a theory of gravity. More importantly, it is a theory of space doing things like gravity. Classical Use Mode thinking has a hard time accepting this, let alone the more complex QM. The result is false attributions, like the idea that a mass shapes the spacetime around it, when really it partly shapes its own spacetime.

The GFE metric tensor ($g(\mu\nu)$) is incorrectly assumed to be intrinsic like $R(\mu\nu)$ and R/2. It is a higher dimension that smoothes lesser conditions to work together[5] by asserting "how to compute the distance between any two points."[6] It is the cross-over point to extrinsic, as with Λ, the cosmological constant.

Our point here is to distinguish intrinsic and extrinsic spaces. We need to further distinguish what is void to what. The universe and cosmic void are both fundamental and higher dimensional. In set theory terms this is like saying it is the least possible subset AND the greatest possible superset at the same time.

This means cosmic void plays two vital roles in all material identities—which means all of their spaces. First, it gives a relatively undifferentiated distribution of value increasing a point of no dimension into dimension at a rate of c. Second, it

[5] Ranicki, A. (Dec. 2005). High Dimensional Manifold Topology Then and Now. University of Edinburgh. http://www.maths.ed.ac.uk/~aar/slides/orsay.pdf.

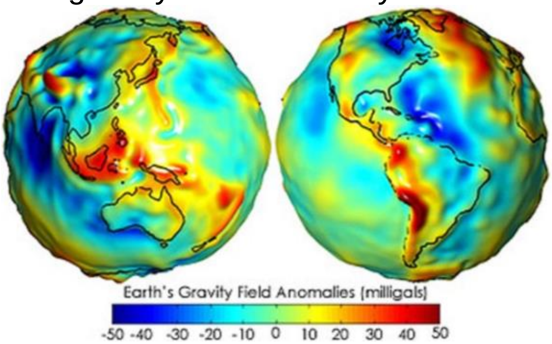
[6] Stover, C. and Weisstein, E.W. (2018). Metric Tensor. From MathWorld--A Wolfram Web Resource. http://mathworld.wolfram.com/MetricTensor.html.

provides what artists call a negative space—a difference between things, also called a Fermi surface.

Both of these applications of cosmic void are actively doing things. It is vital to observe these two roles when we get into things like strong interactions and microstates affecting intrinsic motion, etc. The internal effects are relatively minor simply because they are modestly contained. The external effects are another story.

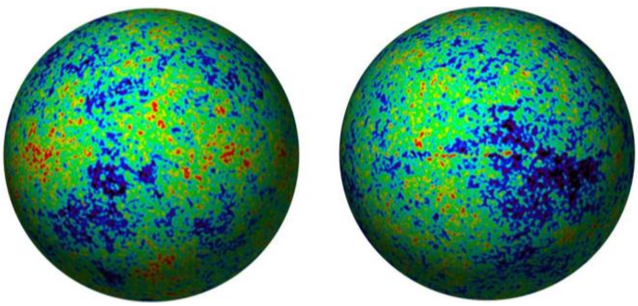
<u>Sea Level</u>

CMBR is energy taken from strong interaction of matter annihilated and enfolded into singularities, and then unfolded out to the cosmic void. This applies at the extremities of lowest fundamental and highest dimensional. Of course these interactions don't have the courtesy of being neatly distributed. The result is irregularity called anomaly.



[7]

Anomaly is another way to say disorder. It occurs in every field, as shown by the anomaly of gravity on Earth above. Sun spots are another example of anomaly. Like sun spots, the anomaly of CMBR varies over time.



[7] Ward, A. (Mar. 30, 2005). <u>Gravity Recovery and Climate Experiment (GRACE</u>. earthobservatory.nasa.gov/Features/GRACE/printall.php.

This NASA WMAP[8] image shows CMBR distribution using the visible light spectrum from highest energy (violet) to lowest energy (red). You are the observer in the middle looking out to the inner surface of a spherical volume. Your position in the universe is always the center (another superposition quality).

With H_0 =70.4, the average distance (radius) attributed to CMBR is about ~14 billion parsecs or 45.66 Gly (billion light years).[9] We are calling this "sea level" because it describes a midpoint in the phenomenon, like taking a cross section of Earth's crust. It peaks at ~46.791 Gly (see pg. 30).

As a cross-section, this WMAP looks like mountains and valleys. The universe is pulling itself apart (blowing up) at rates up to the speed of light. The average rate, however, is only a modest 0.8 c. Light defines the extremities, so c becomes the smoothed surface value and the medium of exchange on all levels of the universe.

In elementary chemistry, the concept of standard temperature and pressure (STP) is used to set a common frame of reference for observations. The standard is set by IUPAC,[10] where pressure is that at sea level. CMBR's "sea level" is the cosmic equivalent. It affects the distribution and patterns of galaxies resisted by their local interactions.

Light & Photons

In the Standard Model, particles can be real or virtual (Gauge).[11] In this way, particles can be used as mediators of energy even though they technically don't exist.[12] The virtual particle system is unclear even among experts.[13]

The reasoning for this is simply that energy has to be put into the context of matter to observe it. Light is propagating energy commonly referred to as radiation like EMR. Radiation

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[8] For current maps and details visit https://map.gsfc.nasa.gov/.

[9] Gott III, J. et al. 2005. "A Map of the Universe." The Astrophysical Journal. 624 (2): 463–484. http://www.astro.princeton.edu/universe/ms.pdf

[10] Nic, M. et al. (Feb. 24, 2014). IUPAC Gold Book: STP. goldbook.iupac.org/html/S/S06036.html.

[11] Nave, C.R. (2017). Feynmann Diagrams. Georgia State University. http://hyperphysics.phy-astr.gsu.edu/hbase/Particles/expar.html.

[12] Breinig, M. & Hitchcock, J. (2012). Physics 250: The Standard Model. http://electron6.phys.utk.edu/phys250/modules/module%206/standard_model.htm.

[13] Strassler, M. (2011). Virtual Particles: What are they? profmattstrassler.com/articles-and-posts/particle-physics-basics/virtual-particles-what-are-they/.

is awkward as a term too as it comes in soft and hard forms. Hard means the radiation can knock an electron out of its orbit.[14] Neither of these terms explicitly requires a real particle, though it is typically implied by "hard."

Light has no spacetime definition of its own, but it gives value to spacetime and from the constructs of spacetimes emerge other values. Light is given qualities from its source to its final destination. These qualities constitute information, such as absorption lines, which affect behavior. Absorption values contribute to the spectrum as attributed values.

They are attributed because the cause of absorption was either a potential taking energy out at a particular frequency value, or an intrinsic value obstructing filling that value. These interference patterns are consistent due to general consistencies in microstates that affect light. All light in a field that is not otherwise modified, will have the same information. This is not to be confused with particle entanglement.

Light can behave both as a particle and as permeation.[15] This doesn't help matters at all. Photons also have a bad habit of simply diffusing as light. We have to make the distinction though for the sake of creating matter and understanding observations. Light provides a scalar form of quantum force.

Photons are neatly packeted and focused. Light is not. If you left the aperture on the telescope open for hours, days or months to capture light, you observed a virtual photon. If it all arrived simultaneously in one focused point without any help, it was likely a real photon. Of course that means you can manufacture photons, but lasers were old news in the 80s.

Distance

Distance is the classical mensuration (measurement) problem of this chapter. The problem is seeing things from the perspective of a quantum universe. The universe gives us the perfect measure: light. Light cannot lie. Make sure adjustments fit context.

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[14] Holman, G. & Benedict, S. (Aug. 1, 2007). What are Hard X-rays? https://hesperia.gsfc.nasa.gov/sftheory/xray.htm.

[15] Sevian, H. et al. (2000). Wave-particle duality. Boston University. http://physics.bu.edu/py106/notes/Duality.html.

Proper distance is the actual distance between two fixed points. Consider a map of Alaska. Assume the map is to scale. If it is a globe, you can use a tape measure to find an exact flying distance of 864 km (537 miles).

On a flat map, you have to account for the curvature of the Earth. If it were light bending over this space, the affected variable would be the omega curvature Ω□. This flight distance we can classify as an ideal proper distance because it has no ambiguities.

The observable universe at 46.791 Gly is an ideal proper distance. Wherever you are is the superpositional center of the universe. The universe expands in every direction up to the speed of light. At the speed of light the wave function of light becomes a flat line.

This measure is ideal because it says nothing about the affects of terrain. Light can easily pass through a contracting spacetime that draws it into focus and causes it to travel much further than the observable limit.

Such a terrain issue would be like saying we will be walking from Anchorage to Nome instead of flying. All those mountains and valleys will definitely add to our distance. Let us say our traveler is carrying a device that measures every meter traveled.

Astronomers are like an observer in Nome collecting the data from these devices coming in from every direction. These numbers are absolute observational values. In astronomy the key number is the redshift z value. The z value is used generically to compute velocity in cz=v.

Light Distance

Light distance is our traveler enduring the long walk through the variations in terrain. Terrain variations guarantee a longer path compared to flying distance. The reason is Relativity. Spacetime densities vary due to the material spaces passed through. These same spaces add curvature we would think of as terrain.

As observers stuck in one location, it is nearly impossible for us to reasonably identify distant terrains unless they are kind enough to throw up a light flag we can see. The inconvenient fact of observational astronomy is that we don't know. We only know the number we observe, and if we are lucky, it and the terrain are close enough that we can make out terrain and motion details.

Distance Functions

Uncomplicated light distance (D□$=cz=c\upsilon_o/\upsilon_e=c\lambda_o/\lambda_e$) is a function of the ratio between observed (o) and emitted (e) values of light frequency ($z=\lambda_o/\lambda_e$) or wavelength ($z=\upsilon_o/\upsilon_e$). Cepheid variables are vital to this because their values are consistent.[16] Another option is to use spectroscopy. Spectroscopy identifies elements by emission and absorption lines on the spectrum.[17]

Spectroscopy and velocity benchmarks up to 1.3 Gly provide our guesstimated terrain issues generically labeled omega (Ω) modifiers. These issues are mass density (m), radiation (r), the cosmological constant (Λ), and the curvature (k) set at 0 assuming flat space.

The numbers provided below are with H_0 =70.4[18] consistent with the established values for CN-z11.[19] The dramatic difference with H_0 =100 or 500**h** Km/s Mpc is in the

[16] Cepheid Variable Stars & Distance. Australia National Telescope Facility. atnf.csiro.au/outreach/education/senior/astrophysics/variable_cepheids.html.
[17] Wiggins, D. (Jun. 28, 2010). Spectroscopy. https://solarsystem.nasa.gov/deepimpact/ science/spectroscopy.cfm.
[18] "70.4 ± 1.4 (km/sec)/Mpc" per: Wollack, E.J. (Mar 25, 2013). Tests of Big Bang: Expansion. https://map.gsfc.nasa.gov/universe/bb_tests_exp.html.
[19] Newman, P. (Jul. 26, 2016). The Farthest Visible Reaches of Space. Goddard Space Flight Center. imagine.gsfc.nasa.gov/features/cosmic/farthest_info.html.

h-error that gives: D□=6,467.4701Mly at 500 (lookback at 1,936.9726My).[20]

ΛCDM model Feb. 2010 Omega Data

Matter Density	$\Omega_m =$	**0.272**
Radiation	$\Omega_r =$	**0.0000812**
Lambda (cosmological constant)	$\Omega_\Lambda =$	**0.728**
"Curvature"	$\Omega_k = 1 - \Omega_m - \Omega_\Lambda =$	**0**
Hubble Constant	$H_0 =$	**70.4 Km/s Mpc**
Transverse Distance	$E(z)^2 = \Omega_r(1+z)^4 + \Omega_m(1+z)^3 + \Omega_k(1+z)^2 + \Omega_\Lambda$	
Given a redshift of	$z =$	**11.1**
Proper Distance	$D_l = dz/dE(z) =$	**45.9337365 Gly**
Lookback time	$t_l = \frac{1}{H_0}\int_0^z \frac{dz'}{(1+z')E(z')} =$	**13.7569076 Gy**

Lookback time (t□) is the standard way to measure distant objects. The idea is to take the transitive value based on when the photons were created.[21] This puts hypothesis ahead of observation, and commit a reification fallacy—attributing concrete reality to an abstract idea.[22]

Our test revealed **the error is compounding the modifier** hidden in the details of these two functions. Proper distance is a subset of the lookback time function. It already contains the modifier. There is no good reason to compound the modifier.

Secondly, photon creation is assumed within the reference frame of ~13,757,283,900 year ago. When you look for a number, you set yourself up to find it, correctly or not. The **photon's redshift tells you exactly how old it is**.

Third, another test…. Using H_0 =70.4 with CN-z11 at z=11.1 (45,933.7365Mly),[23] IOK-1 at z=6.96 (45,564.4571Mly)[24] and their difference 369.2794Mly (only .5 My lookback difference!). This is practically next door. We

[20] Jordaan, B.A. (2009). Relativity 4 Engineers. Ebook. Calculator: www.einsteins-theory-of-relativity-4engineers.com/cosmocalc.htm.

[21] Hogg, D.W. (2000). Distance measures in cosmology. Princeton, NJ: Institute for Advanced Study. https://arxiv.org/pdf/astro-ph/9905116v4.pdf.

[22] Whitehead, A.N. (1929). Process and reality. New York: Harper.

[23] Oesch, P.A. et al. (March 3, 2016). A Remarkably Luminous Galaxy at z=11.1 Measured with Hubble Space Telescope Grism Spectroscopy. ESA Hubble. www.spacetelescope.org/static/archives/releases/science_papers/heic1604a.pdf

[24] Hogan, J. (2006). Journey to the birth of the Universe. Nature. https://www.nature.com/articles/443128a.

note and ignore the decimal needs floating to get “established” values.

Let us analyze the logic of z-functions that incorrectly concludes $z>1$ means $v>c$[25] and explain apparent dilation at extremes like z=24,486.4.

$$\mathbf{z\,\lambda' = \lambda - \lambda' = \delta\lambda}$$

First, z is a unitless measure of drift—the increment of change in frequency ($\delta\upsilon = \upsilon' - \upsilon$). Drift is exposed as the defining feature by unit discrepancy in $\lambda^2 = c \pm v$, corrected by $\lambda = (c \pm v)/\delta\upsilon$.

Drift translates frequency change into a duration ($1/\delta\upsilon$) and length ($c\delta\upsilon = \delta\lambda$). This duration and length are proper measures under condition of no resistance to void expansion. It solves the unit discrepancy, cancels in translation, and gives co-velocity relative to c: $v = \delta\lambda\delta\upsilon$.

This expansion of the universe is limited to the total drift potential from one end of the light spectrum to the next at v=c. For sake of argument we can set c–v=1m/s and c+v=2c so all light flatlines at

$$\mathbf{z = \delta\lambda/\lambda' = \sqrt{(2cs/m)} = 24{,}486.4.}$$

Resistance to expansion prevents direct conversion into distance. Decrease in resistance to expansion increases the drift rate. At z=24,486.4, H_0 =70.4 we calculate D□=46.791Gly as the light horizon and t□=13.757Gy (BBT).

Publishing z with inadequate explanation is confusing. The cause is dilation, Minkowski, or comovement. If we were this far in the future looking back on our present, our present would be just as spread out as the past we are currently looking at.

This is true at every observational position in time or space. That makes it a Quantum Shade feature manifesting as the expansion of void relative to the resistance to said expansion. Objects in the view finder are much closer together than they appear.

Just as reducing resistance shortens the distance to observation, it also shortens the distance between objects along that relative surface. As you expand the horizon of observation, the horizon containing your observational perspective shrinks to a relatively static proportion.

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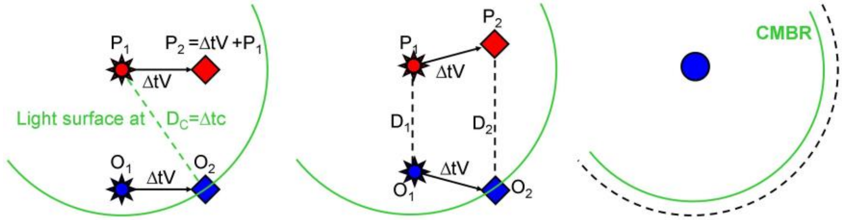
[25] Wright, E.L. (Feb. 23, 2002). Doppler Shift. astro.ucla.edu/~wright/doppler.htm.

Comovement

The effect of the omega modifiers across the terrain is called the transverse comoving distance. Transverse is a fancy word for across. Comoving means as it suggests: two objects with common velocity on parallel and otherwise equal paths. Comovement as a variable does not reduce the distance or time light traveled. It can affect the current distances between objects.

As light traverses greater distances, the expansion of void stretches the wavelength and diminishes the flow of energy (flux=S) and luminosity ($L=4\pi D\square^2 S$).[26] A standard luminous reference like a Cepheid or supernova provides a convenient frame of reference to compare the Doppler and distinguish expanding void from local velocity and direction. Andromeda is so local, blueshift alone indicates it is on a collision course.[27]



Static, Flat Space $D_0^2=D_C^2-(\Delta tV)^2$ | Dilated Co-movement Use Minkowski Diagram | Expanding, Flat Space Use Proper Distance

The problem of what to use when boils down to proximal relationships. Imagine a round table surface. You have two objects moving at the same velocity on parallel paths (first part of the diagram).

The observer (O) sees the history of light from the other moving point (P). Granted it is a pretty recent history. Next, numbers in fractions of the speed of light are definitely subject to dilation. Special Relativity applies—use Minkowski.

Important to note that time (t), distance (x), and velocity (v) are reduced to unitless fractions of the speed of light. This makes for easy conversion into circular functions.[28] Original

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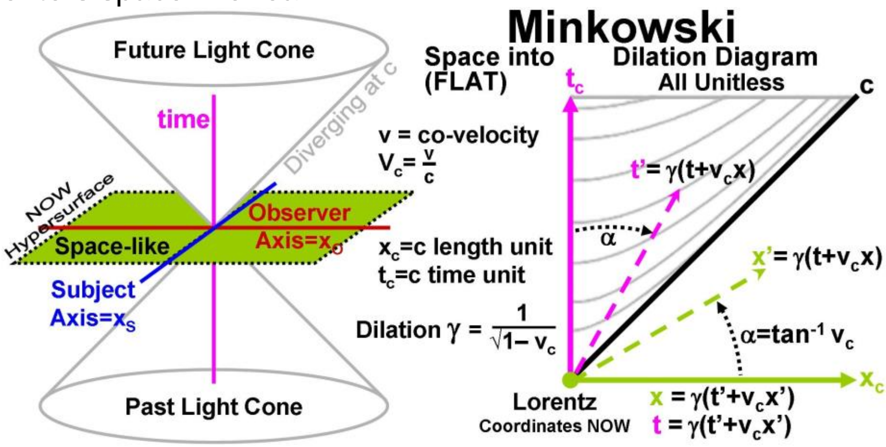
[26] Pogge, R. (2006). The Cosmic Distance Problem. Ohio State University. http://www.astronomy.ohio-state.edu/~pogge/Ast162/Unit4/cosdist.html.

[27] Phillips, T. (May 31, 2012). Astronomers Predict Titanic Collision: Milky Way vs. Andromeda. Science@NASA. https://science.nasa.gov/science-news/science-at-nasa/2012/ 31may_andromeda.

[28] Minkowski, H. (2012). Space and Time: Minkowski's Papers on Relativity. Minkowski Institute. http://rgs.vniims.ru/books/spacetime.pdf.

values are indicated by primes (x', t') as opposed to current values. As v→c, t→0, but at v≥c, t is empty set and distance enters space-like realm.[29]



Into Shade

Void is the dominant feature of the left-handed universe[30] of disorder. It is commonly called **dark energy**. We give it the material variable designation of μ (mu). This is misleading as points and expanding void are technically virtual mu.

Void makes up about 73% of value in the universe, which includes the 5 percentage points attributed to conventional mass. If we lump all the dark matter (ν=order) into a unit value (1), the dark energy with conventional matter would be e for an order to disorder (ν:μ) ratio of 1:e (27:73).[31]

Void is the transport layer of our architecture, meaning it conveys values between Use Mode (the range of actual matter) with Phase Mode (the action of order sustaining disorder). Order needs the Use Mode and workable matter to act, and that action feeds into disorder.

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[29] Asmodelle, E. (Aug. 8, 2016). Pseudo-Orthogonal 4D Representation of Minkowski Spacetime. https://www.linkedin.com/pulse/pseudo-orthogonal-4d-representation-minkowski-estelle-asmodelle/.
Evensen, K. (2009). An interactive Minkowski diagram. trell.org/div/minkowski.html.
[30] Egede, U. (May.11, 2006). Rare Decays at LHCb. London: Imperial College. https://www2.ph.ed.ac.uk/event-resources/ppe/2006/egede.pdf.
[31] (Jan 18, 2018). Dark Matter. CERN. https://home.cern/about/physics/dark-matter.

The speed of light as a constant derives from void expansion and the cosmic clock. These are not to be confused as reflecting the current CMBR flux (e.g. luminosity) value. That varies across the cycle. There are points where CMBR flux would seemingly describe a bigger universe, just as now it describes a smaller one.

CMBR flux affects the force of expansion and the rates matter is created and evolved even in isolation. This acts as a hidden variable in decay series we could never measure. It can also distribute unevenly due to local potentials.

Cosmic void expansion, the speed of light, and the cosmic clock are all set by the cycle via Quantum Shade. The universe depends on anomaly to function. Quantum Shade resolves the inconsistent anomaly by smoothing this relationship as a fixed proportion across all spacetime.

Most baffling of all, this means the entire universe already happened. And it only had to happen once, just like any other identity. Once that cycle is defined, it just is. Meanwhile, we weary travelers just happen to be stuck trying to work things out navigating the pages of history the slow way around.

The inconvenient truth of the matter is that Bell's theorem applies. The universe is one giant QM problem, and there is no way we can possibly acquire or identify all the variables, values, or computational power to calculate them. We must treat it as a QM problem or forever be chasing houses on the winds of tornadoes in Wonderland. [32]

[32] Bell, J.S. (Nov. 4, 1964). On the Einstein Podolsky Rosen Paradox. Madison, WI: University of Wisconsin. cds.cern.ch/record/111654/files/vol1p195-200_001.pdf.

Creating Singularities

The concept of singularity originates in mathematics where it describes the breakdown of a mathematical object or a misbehaving exceptional condition—wherever an equation "blows up" and becomes degenerate.[1] We tend to think of singularities in relativistic black hole terms.

Einstein's Special Relativity emerged in two of his four 1905 science journal articles.[2] [3] Over the next ten years, his ideas soaked into the scientific community while he worked out the General connection. From General Relativity came cosmology in 1917.[4] This was a static universe that is spatially finite, with a uniform distribution of matter, introducing the concept of gravitational singularity.[5]

Einstein received the Nobel for his contribution to the photoelectric effect, which kicked off the pursuit of quantum theory.[6] Despite his plethora of contributions to quantum theory, he dismissed QM with "God does not play dice." His singularity, as we shall see, is Relativity bridging into QM.

Mathematical Root

The 18th Century successors of Leibnitz (1646–1717) and Newton (1642–1727) waged a mathematical revolution. They included Laplace, Legendre, Lagrange, Euler, the Bernoulli's, L'Hopital, Taylor, Fourier, Poisson, and the next generation of Gauss, Fourier, Herschel, Ampère, et al.[7]

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[1] Weisstein, E.W. (2018). Singularity. From MathWorld--A Wolfram Web Resource. http://mathworld.wolfram.com/Singularity.html.

[2] Panek, R. (Jun. 2005). The Year of Albert Einstein. Smithsonian. smithsonianmag.com/science-nature/the-year-of-albert-einstein-75841381.

[3] Einstein, A. & Minkowski, H. (1952). The Principle of Relativity. Dover.

[4] Einstein, A. (1917). Cosmological Considerations in the General Theory of Relativity. Trans. Perret, W. & Jeffrey, G.B. einsteinpapers.press.princeton.edu/vol6-trans/433.

[5] O'Raifeartaigh, C. et al. (Jan. 25, 2017). Einstein's 1917 Static Model of the Universe. https://arxiv.org/ftp/arxiv/papers/1701/1701.07261.pdf.

[6] Darling, D. (2016). Einstein and the Photoelectric Effect. daviddarling.info/encyclopedia/E/Einstein_and_photoelectric_effect.html.

[7] Wilkins, D.R. Mathematicians of the Seventeenth and Eighteenth Centuries. Trinity College, Dublin. maths.tcd.ie/pub/HistMath/People/RBallHist.html.

Practically anyone who was anyone in the world of mathematics you see prominently in advanced mathematics textbooks today lived in the 18th Century. This includes Partial Differential Equations, the original concepts that would evolve into manifolds, and the first of what we can consider modern field equations like Poisson and Gauss's gravity.

To prove his profound ideas, Einstein needed a way to link his thinking with established physics. Gauss and Poisson paved the way to connect Special Relativity thinking to Newton's Inverse Square Law.[8] Einstein's Relativity simply evolved a system of thought with already deep roots.[9]

No one was ready to properly analyze the singularity Einstein saw in his field equations. The first clue predated Einstein. Planck's "Black Body Theory" of 1900 is typically where a history of quantum theory begins.[10] The perspective didn't really take off until Einstein's contribution to the photoelectric effect, likely due to his popularity in an emerging video news media.

It wasn't until Schrödinger's cat in (1935[11]) that the concept of superposition was introduced to begin explaining what Einstein was looking at. By this time, Relativity and Quantum Theory had established separate camps, leaving the gravitational singularity in the wrong camp.

Quantum Approach

Einstein's geodesic field equation (GFE) emerges into an evolved form of the Poisson-Gauss field equation for gravity. This enabled him to transition from GFE and spacetime doing things (field theory) into Newton's Inverse Square Law.[12] It also revealed boundary conditions where classical gravity breaks down as its variables quantize.

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[8] Brown, K. (2017). Poisson's Equation and the Universe. mathpages.com/home/kmath711/kmath711.htm.

[9] Petrov, V.A. 100 Years of Relativity Crucial Points. Protvino Russia: Div. of Theoretical Physics, Institute for Higher Energy. web.ihep.su/library/pubs/tconf05/ps/c5-2.pdf.

[10] Cresser, J. (2009). The Early History of Quantum Mechanics. Macquarie University. physics.mq.edu.au/~jcresser/Phys201/LectureNotes/EarlyHistory.pdf.

[11] Schrödinger, E. (Nov. 1935). The Present Situation in Quantum Mechanics. Naturwissenschaften. https://doi.org/10.1007/BF01491891.

[12] Carroll, S.M. (Dec. 1997). Lecture Notes on General Relativity. UC Santa Barbara. https://arxiv.org/pdf/gr-qc/9712019.pdf.

Einstein evolved the Poisson-Gauss function by using the Schwarzschild radius (r□$=2MG/c^2$),[13] with M being in the $T(\mu\nu)$ manifold. This starts the equation with a template defining the potential of what the space being used can contain (permittivity).[14]

Value permeates into this space to fill a spacetime in degrees. Newton's constant is a form of permeability—the effect of energy on a spacetime. The permittivity-permeability product=c^2—defining a fully occupied spacetime. The 2 is doubling the spherical radius to define its circular surface.

$T(\mu\nu)$ provides a linear pressure value (kg/m s^2)[15] to a spherical angle (4π) in a spacetime ($/c^2$). Angular permeability derives from magnetic permittivity, so: $4\pi T(\mu\nu) \rightarrow \acute{\varepsilon}_a = 4\pi\varepsilon_0\, c^2$. Divided by c^2 reduces this to mass per volume (kg/m^3).

As we take this apart, we can see a myriad of ways it can be interpreted. In a quantum universe, all of these interpretations are potentially valid put into the right contexts. This can be incredibly confusing and misleading. As a rule, a valid solution can be arrived at by at least two discrete and empirically provable paths.

Einstein tripped on the boundary conditions and realized that this function could be read classically or as a singularity. By singularity we can see two manifolds reduced to one and eventually "quantized" at a boundary condition where ordinary behavior no longer occurred.

To quantize means to achieve the unit value of a quantum number. A quantum number is a fundamental property that can be measured. A fully occupied space can describe several quantum states: linear, angular, spin, magnetic, etc. Each of these is defined by a combination of permittivity (what is allowed) and permeability (how it is applied).

A permeability-permittivity product is always a fully occupied spacetime. Each of these quantum states when filled becomes indistinguishable from the others. Einstein's reduced

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[13] Schwarzschild, K. (1916). About the Gravitational Field of a Mass Point According to Einstein's Theory. German Academy of Sciences in Berlin.

[14] Bevelacqua, P. (2012). Maxwell's Equations: Permittivity. http://maxwells-equations.com/materials/permittivity.php.

[15] Myers, A.L. (2016). Natural Units of General Relativity. University of Pennsylvania. https://www.seas.upenn.edu/~amyers/NaturalUnits.pdf.

Poisson-Gauss function already had the Schwarzschild boundary condition set in it. Now all you need to do is slide the variable to Newton's G and everything breaks down.

The assumption of his functions is that a surface (R) is acting on an R(μν) volume. The action creates a range between these of increasing pressure toward the inner boundary which is the gravitational vector. He assumes the inner boundary is the geometric origin. He also assumes at the boundary conditions the same thing keeps happening, such that the vector approaches infinite at the origin.

He was wise enough to observe that the surface enfolds the volume, but did not know what to do when the previously rigid volume suddenly disappeared. It is really no wonder at all why he spent little time investigating or writing about this. It was clearly a QM issue, and he preferred his familiar world to Quantum Wonderland.

Failing to follow through, however, has its hazards. The result is a lot of classical misconceptions about a quantum phenomenon. Einstein could never imagine these two field equations specifically define all four types of quantum gravity based on context: tension, classical, pressure, and micro—but not Loop Quantum Gravity. We will get there.

Thermodynamics

Introduced in the 19th Century, Thermodynamics is indisputable practical engineering and an advanced topic. It is the key change element to all material changes, including the universe in total. Let us examine the three core laws and enhance them with Perkins' conversion and Fleming's sequence. We ignore the "zeroth law" (algebraic commutation: if a=b and b=c then a=c) and competing 4th law suggestions.

1. **Conservation**—Part but not all energy (efficiency) put in a system (**δQ**) converts to work (**δW**), the totality increasing the energy of the whole (**dU**= δQ ± δW).[16]

   δQ enters a system opportunistically as: intrinsic to matter, radiant light, transferred or shared by interaction. Work on the

[16] Kreidenweis, S. (2011). The First Law of Thermodynamics: Conservation of energy. chem.atmos.colostate.edu/AT620/Sonia_uploads/ATS620_F11_Lecture2/Lecture2_AT620_082411.pdf

system is dU=δQ+δW equivalent to relativistic momentum. Work done by the system is dU=δQ–δW.

Never assume TdS–PdV translates directly into δQ±δW in a complex system. Work is a subjective term, especially if your work is producing heat or diversity, or the energy acting on the system is intrinsic PdV (e.g. gravity). Contextual opportunism emerges in the 4th law, dividing things whichever way is most expedient. The emergence of a singularity in the 3rd Law is another loophole.

2. **Multiplicity**—Disorder/degeneracy (S) increases in an isolated system toward “thermal” (T) equilibrium.[17]

Read “thermal” as transferable, linking change in T to volume (dV) and dS to pressure (P) in an isolated system. True also in a symbiotic system, except dS and V can increase for one part of the system as they decrease for another. Multiplicity=diversity of change functions (classic entropy, QR, QCD).

Equilibrium here clearly means energy is being absorbed or emitted. It can also mean an imbalance of normalized (smoothed) distribution. Such an imbalance can certainly be causal of emission or absorption.

3. **Reduction**—A “perfect crystal” at absolute 0=T has no disorder (S=0). More simply: at dU=PdV, T=dS=0.[18]

This is thermodynamic singularity. Ironically, matter is termed degenerate when disorder approaches zero (S→0). An isolate creates a singularity by regionally focusing multiplicity (5th Law). Singularity then consumes the remaining isolate, strongly interacts with some of that consumption and emits the annihilation triggering the LAE process.

4. **Conversion**—Helical changes[19] (i) to radiant ($-ɦE_1 \equiv pc$) energy apply degrees of work conveniently to AND by the intrinsic definition ($-iɦE_1 \rightarrow \jmath E_0 \equiv mc^2$). See image below.

$$\{ [dU=\imath E_2] = [\delta Q=-ɦE_1] \pm [\delta W=\jmath E_0] \}^2 \equiv \{ (pc)^2 + (mc^2)^2 \}$$

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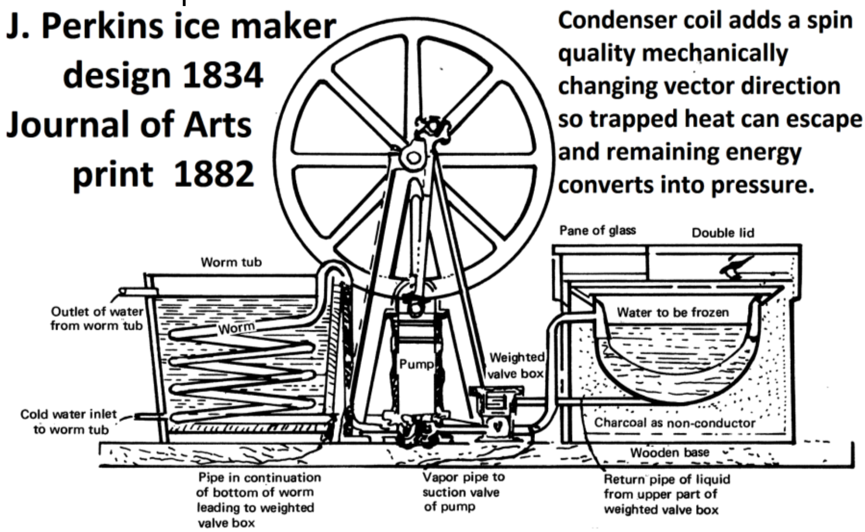
[17] Lintner, B.R. (2015). Thermodynamics of the Atmosphere: Lecture 12. Rutgerss University. http://envsci.rutgers.edu/~lintner/thermo/Lecture12.pdf.

[18] Kyle, B.G. (1994). The Third Law of Thermodynamics. ufdcimages.uflib.ufl.edu/AA/00/00/03/83/00123/AA00000383_00123_00176.pdf.

[19] Not to be confused with a heat sink using 2nd Law thermal conductivity to redistribute heat away from a body.

Combines Euler's $z=x+iy$,[20] Relativistic Momentum,[21] Parallelogram Law,[22] Perkins' ice maker,[23] Conservation,[24] Fleming's rules,[25] logical operators (later), and the 1st Law. The complex components make work on OR by the system equivalent in Relativistic Momentum as $\pm(\text{ɦ}^2 \equiv \text{ɩ}^2 \equiv \text{ȷ}^2) = -1$. Relativistic equivalence makes OR into a simultaneous AND.



Work is distributed conveniently (e.g. path of least resistance) in degrees to the intrinsic definition (absorbed) AND by the intrinsic definition (emitted). The universe given two solutions by its own rules finds a way to apply both, visible in spectrum analysis.

Treated as a generic mechanical operator, the imaginary number (i) rotates axes to make linear and sinusoidal systems compatible in Complex Variables (the mechanical roots of Differential Equations). It works mathematically AND logically the same as the imaginary operators used here to define color

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[20] Song, H.A. (2008). Euler's Equation. http://www.songho.ca/math/euler/euler.html.
[21] Nave, C.R. (2017). Relativistic Momentum. Georgia State University. http://hyperphysics.phy-astr.gsu.edu/hbase/Relativ/relmom.html#c1.
[22] Jeffreys, H. and Jeffreys, B.S. (1988). Methods of Mathematical Physics. 3 ed. Cambridge, England: Cambridge University Press.
[23] ASHRAEnews. twitter.com/ashraenews/status/895618941887827969/photo/1
[24] Noether, E. (1918). Invariant Variation Problems. Nachr. D. König. Gesellsch. D. Wiss. Zu Göttingen, Math-phys. Klasse. pp 235–257.
[25] Daware, K. (2014). Fleming's Left Hand Rule And Right Hand Rule. http://www.electricaleasy.com/2014/03/flemings-left-and-right-hand-rule.html.

change functions. When the operator disappears, the logical function remains to haunt buried in the definition.

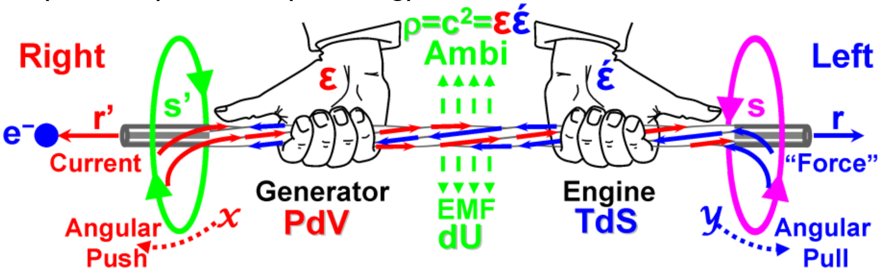
1. **Hierarchy**—Field axes of the same magnitude are at right angles to each other,[26] ordered by scale from lowest to highest: gravity (g), thermal/heat (T), centrifugal (C'), centripetal (C), electromagnetic (e).

Order is set by following the value sequence in Fleming's rules illustrated below. It demands an evolving system of fields/matter. This law is also a function of Relativity forming a singularity in a stellar body[27] deriving from the 2nd Law.

Relativity

Einstein tried to avoid wrapping his head around singularities too much, and we will soon see why. The functions can be interpreted from the variable perspectives of linear (surface) or angular (volume), and in how they are created. Singularities are created in one of two ways: thermodynamic or quantum fluctuation.

The second law of Thermodynamics states that disorder (S) increases in an isolated system[28] due to inefficiency of converting energy into work. What it doesn't say is where disorder increases or how. We can resolve this by our added 4th (Perkins) and 5th (Fleming) laws.



Fleming's right and left hand rules are used to show the direction of energy being generated, its application in a working engine [29] and its ambient loss. This particular diagram

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[26] Parallelogram Law.

[27] Mastin, L. (2009) Creation of Black Holes. http://www.physicsoftheuniverse.com/topics_blackholes_blackholes.html.

[28] (Nov. 5, 2016). 2nd Law of Thermodynamics. University of CA, Davis. chem.libretexts.org/Core/Physical_and_Theoretical_Chemistry/Thermodynamics/Laws_of_Thermodynamics/Second_Law_of_Thermodynamics

[29] Daware, K. (2014). Fleming's Left Hand Rule And Right Hand Rule. http://www.electricaleasy.com/2014/03/flemings-left-and-right-hand-rule.html.

breaks down into specific quantum forces for a more detailed analysis of chromodynamics. Ordered forces r' and y correspond with gravity and centripetal, where r and x are heat and centrifugal disorder.

The generator converts a disordered value for transport by an ordered conveyance. Since this is an excess of the conveyor's identity, it is easily lost to other potential conveyors or as light (EM) emission. This loss can happen anywhere in the system. Some of this disorder gets converted into subjectively defined work. In other words, the work can be order, disorder, or both.

Fleming's rules gives us a natural sequence putting order before disorder—gravity before heat. If we are thinking about a solid-state thing, the inefficiency will apply generally to the whole, putting the EM both last. The main vectors in their solid state sustainable order are gravity (order), heat (disorder), centrifugal (disorder), centripetal (order), and EM (both).

This is important to us for creating a quantum singularity thermodynamically, then explaining its two fields. The universe always takes the path of least resistance—and to degrees all the others too.[30] The path of least resistance is to follow this sequence.

Order focuses in toward the core of a body and disorder away from it. This conserves energy, optimizes stellar processes, and evolves matter. For our sake, we are concerned with the formation of a singularity. The thermodynamic path is to fill the volume to its boundary condition. It sounds easy, like filling a tub. It isn't easy because the pressure has to become so intense that matter degenerates to the components of its strong interactions.

As the star fills and degenerates this volume, it begins a path into either filling the volume OR incidentally vacating a surface. We mentioned earlier that Einstein's GFE contains elements for microgravity—specifically, $g(\mu\nu)$ and Λ are environmental variables.

A boundary between the volume and environment filling it forms. This is what artists call a negative space—a difference

[30] Holt, M. (Jul. 1, 2001). The Path of Least Resistance. ecmweb.com/content/path-least-resistance

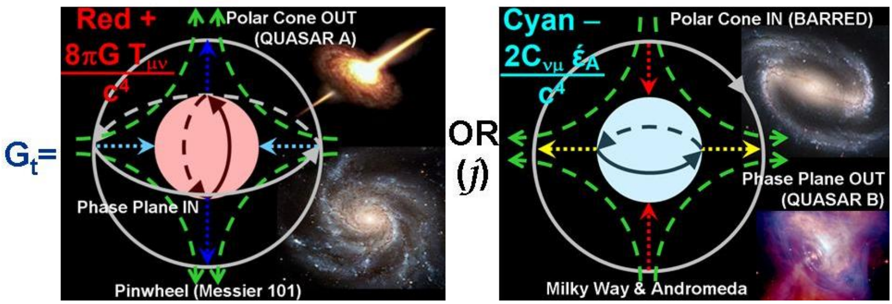
between things. Drawing in lines like cartoonists is one way to show negative space. Here, the negative space is a surface with tension, which Einstein defined as T(μν).

The volume and surface values are both variable. They are now in a race toward their boundary values. It only takes one to achieve its boundary value to trigger singularity. Which one will determine the type of singularity created.

$T_{\mu\nu}$	Angular stress-energy	$kg/m\ s^2$	Pressure parallel to surface=$f(\acute{\varepsilon}_A)$
$C_{\nu\mu}$	Linear stress-energy	$m^3/kg\ s^2$	Volume mass density =$f(G)$

Boundary

$$\Rightarrow \frac{2G\,\acute{\varepsilon}_A}{c^4} = \left(\frac{2G}{c^4}\right)\left(\frac{4\pi}{\mu_0}\right)$$



On a superficial level, whichever one achieves its boundary condition first is treated as the enfolding surface. The second value becomes enfolded content strongly interacting with and growing the singularity. What doesn't interact gets ejected.

The picture mostly depicts super massive black hole formation and relationship to types of galaxies. Type A ejects by polar jets to vacate its T(μν) "surface" holding the "volume" constant. This body can consume and emit simultaneously. It can be rotating quickly like a lighthouse as with pulsars. On a galactic level, these are pinwheel-style spirals.

Type B ejects in circular pulses to vacate its "volume" C(μν) holding the "surface" constant. The Crab Nebula pulsar is used as an example because there are time-elapsed videos of it actually doing this.[31] A sombrero galaxy is a good example, except the time elapse is a tad long. This type of black hole creates a bar-style spiral galaxy like the Milky Way. This is the shape of Lemaître's big bang.

There is also a third type where these two interact and try to annihilate each other. Of course there are also mergers, which are also quite fun. Generally, however, bodies created at a stellar level are unlikely to join the super massive big leagues except by merger. If they are big enough to be a neutron star, they may act as a nucleation point in a super massive star. But now we diverge from our story.

Quantum Fluctuation

Change is conserved subject to Noether's Theorem. The universe conserves change by applying or removing it where it conveniently can. This is seen as quantum particles popping in and out of existence, called quantum fluctuation.[32]

Super Massive Black Holes (SMBH) are in a special league all their own. There are three ways to create an SMBH: merger, metastar thermodynamics, or quantum fluctuation. The metastar hypothesis is unlikely but still open. The most likely candidate is fluctuation followed by mergers.

For the Thermodynamic approach we could either fill the volume or vacate the surface. Quantum fluctuation seems like a no-brainer. Simply create an intense enough vacuum right? Wrong. The universe is already using that space. It wants something it isn't using, like your space. It will look at your space as a viable candidate from the very bottom of quantum chromodynamics and how matter forms from light.

Helicity v. Chirality

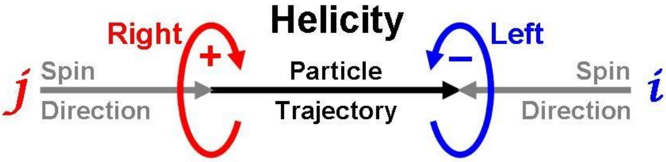
Helicity divides matter into right handed particles that move the same direction as they spin, and left handed that move the opposite direction of their spin.[33] These hands correspond with

[31] (May 20, 2013). Chandra Monitors the Flaring Crab. NASA Video. https://www.youtube.com/watch?v=PiXOaGuhlLQ.

[32] Strassler, M. (Aug. 29, 2013). Quantum Fluctuations and their Energy. https://profmattstrassler.com/articles-and-posts/particle-physics-basics/quantum-fluctuations-and-their-energy/.

[33] Dreiling, J. & Gay, T. (2014). Chiral Photons and Electrons. University of Nebraska. http://physics.unl.edu/~tgay/content/CPE.html.

Fleming's rules.[34] This is the product of how the microstates in a particular change function define their spaces.



Chirality is the quality of not being identical to its "mirror" image. Red and anti-red (cyan) color charges (see pg. 42) are chiral because they have the same right-handed change function (j), but their field dispositions are inverted. Such chirality describes virtual particle and anti-particle.

Photons (and presumably neutrinos) consist of entangled pairs of particle and anti-particle, reverting their chirality to two helicity states (± circular polarization, or = becomes linear).[33] Helicity of Weyl fermions prevents their annihilation as chirals but does cancel weak interaction and mass.[35]

A particle anti-particle pair is created by adding energy to the confined spaces of an entanglement band or "flux tube" pair until they quantize.[36] A photon from electron quantum leap is the most familiar example. [37] These always occur in positive and negative pairs, and not necessarily entangled as with photons. Gluons split into new pairs.

The energy going into this is light. Light has both attributed (EMA) and emitted (EMR) values in it.[38] Both EMA and EMR will contribute to momentum and new particle creation. When EMR quantizes, the perfect child splits into chiral particle and anti-particle. Like our singularities, EMA and EMR are in separate fields.

The division follows an EMA information pattern specific to the host's intrinsic values and microstates. We observe this in

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34 Klauber, R.D. (2017). Chirality vs. Helicity Chart. quantumfieldtheory.info/Chiralityvshelicitychart.htm.

35 Romão, J.C. & Silva, J.P. (May 29, 2016). Helicity and Chirality. Instituto Superior Técnico. porthos.tecnico.ulisboa.pt/CTQFT/files/HelicityAndChirality.pdf.

36 Smilga, A. (2001). Lectures on Quantum Chromodynamics. World Scientific. Muta, T. (2009). Foundations of Quantum Chromodynamics: an Introduction to Perturbative Methods in Gauge Theories. 3 ed. World Scientific.

37 Schombert, J. (2015). Quantum Physics. University of Oregon Department of Physics. http://abyss.uoregon.edu/~js/cosmo/lectures/lec08.html.

38 Mattson, B. (Mar. 2013). The Electromagnetic Spectrum. imagine.gsfc.nasa.gov/science/toolbox/emspectrum1.html.

light,[39] which is subject to the same extratemporal change conditions as it bleeds from a source including a photon. Naturally this robs the system of all the associated momentum and related qualities.

The universe uses things that aren't there, conserves them because they quantize, AND consequently make quantum wholes far greater than the sum of their actual parts.[40]

An isolated system will quantize that excess into virtual particles, like Weyl fermions.[41] We call them virtual because they instantiate—meaning they only exist in a very narrow context unless they can be confined in another identity like a lepton. SMBH are not temporary instantiations to us. To the universe, however, they are.

Instantiation is consistent with the change function of a whole. Every isolated system is contained by its own change function. It doesn't matter how far you spread the parts of the system, the change function defines the entire system simultaneously.

We use the term phase to describe this change moment idea. In the architecture we refer to the interconnectivity on a universal level as Quantum Shade. Quantum Shade isolates our system across all space and time. It doesn't care CMBR has a different flux rate here or there, or the void is unequal in this phase moment to another, etc. The 1:e balance of singularities with expanding void transcends all time and space.

Quantum fluctuation induced phenomena like SMBH can seemingly happen anywhere any time by our reckoning. By cosmic reckoning, such an instantiation is a localized Möbian twist in the Occam's Cycle. It is in no way a random event. It doesn't need your space, at least not yet.

QR Field Shapes

In Relativity, spacetime does things. The quantum universe is mostly synonymous with pure mathematics. In mathematics,

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[39] Wood, D. (2018). Atomic Spectrum: Definition, Absorption & Emission. study.com/academy/lesson/atomic-spectrum-definition-absorption-emission.html.
[40] Antithetical to "A system is more than the sum of its parts," Aristotle.
[41] Xu, S. et al. (Aug. 7, 2015). Discovery of a Weyl fermion semimetal and topological Fermi arcs. http://science.sciencemag.org/content/349/6248/613.

space is an ordering set with structure potential. You can think of a blank page as a space to add axes, scales, etc. Space specifically isn't doing anything until it gets defined.

Defining a space requires magnitude and change—which gives direction. These same features technically make that a vector space. All spaces in the quantum universe are vector spaces, so we won't quibble. Instead we will redefine this **ordering set with potential for structure** as a **manifold**.

When a manifold exists, it has two shapes: applied anomaly and smoothed. Smoothing is a role of the specific change function called an entropy (see inset for reasoning). A manifold is a confined quantum variable, meaning it only occurs in a proportion with other variables and it can quantize. To create a manifold from scratch:

2. Value accumulates in an existing available entropy space—typically an entanglement band/flux tube.
3. Accumulation activates the otherwise inactive available space.
4. That value quantizes—becomes a proportional unit relative to the change space provided.
5. Quantization triggers independent microstate sequence causing a change in relationship with the host (parent).

Redefining Entropy

We tend to think of change as transformation, conversion into another function (e.g. Leibnitz) or context (e.g. Newtonian surface to volume). Transformations affect position or superficial qualities, but not the defining shape. This includes: rotation (orientation), translation (moving), reflection (flipping), observational dilation (expand/contract) and scaling (resizing).[42]

In modern Thermodynamics, entropy is used to indicate disorder—the inability to convert energy into work. Why not just say disorder? Disorder already is one readable word. The ambiguity of terms better fits a more mathematically complex role as it was originally intended for.

Entropy derives from ἐν (in) + τροπή (transformation, a turning, change), with Clausius meaning to transform between

[42] Stapel, E. (2016). Function Translations. purplemath.com/modules/fcntrans.htm.

heat and work.[43] The first law ($dU=\delta Q-\delta W$) is the defining transformation of Thermodynamics. Disorder (S) is the directional predisposition of that change (second law).

We will call these defining change actors entropies. As logical quantum functions, they are all treated primarily as unit quantum numbers. These quantum numbers associate directly with the quantum numbers known as colors or color charges, with anti-colors as their chiral forms.

The entropy of a quantum number identity like a singularity or color charge defines two manifolds. The manifolds of nu matter (singularities ν=order) are sequential, whereas the manifolds of mu (μ=disorder) are concurrent. The first manifold for each is given linear values, whereas the second receives angular.

Perspective determines how EMR and EMA values apply to singularity manifolds. Each change function has a dominant feature appearing as the first sign in its definition. This is the feature whose boundary condition satisfied singularity (bold).

Red ȷ = + OR – (**EMR** volume **|** <u>EMA</u> surface)
Cyan ȷ' = – OR + (**EMA** surface **|** <u>EMR</u> volume)

The second variable is the total absorption capacity—permittivity. This quantity is a total EMR and EMA of absorbed matter. It can only absorb matter with no guarantee of interaction. Mass only matters for external interaction resulting in absorption. Mass otherwise makes no difference to a strongly interacting body.

The geodesic function defining local “surface gravity” is really microgravity. For this, the volume is defined by the first value as fully occupied volume. The surface is defined by the negative space displacement between that volume and the local phase space.

That is not to say the microgravity is small here or anywhere. On the contrary, it is dispersed far wider because it is the environment acting on the body—what are shown in the GFE as cosmological variables Λ and g($\nu\mu$). This is the ranged long-wave gravity that is a significant component of LQG (for orbital relationships).

[43] Carnot, S. (Aug. 5, 2014). <u>Entropy</u>. eoht.info/page/Entropy+%28etymology%29.

Among particles, microgravity is insignificant due to magnitudes and hierarchies. It makes the object relatively viscous (stick) making it ideal as a nucleation point for an array of quantized vector interactions. It significance should not be dismissed. The microgravity space is also where light diffracts around most bodies (gravitational lensing).

Ordinary lensing ends with the microgravity space. This lensing continues to exaggerate by the enfolding surface. The enfolding surface is responsible for inability to interact with light. The surface edge with no depth faces into the light, whereas its application to a volume is the temporal quality forcing propagation to go around.

The most significant feature is the composite full force of the singularity defining the polar/equatorial jets and intake. This is Pythagorean ($F^2=R^2+A^2$) and violates spacetime constraints. The universe cheats. It widens apertures and sets them away from the source far enough that no violation occurs. These variables affect flux (flow) in and out.

If we ignore the rest of the universe around the singularity, we already have one of two sorts of whirlpool. Einstein's visualization of this was truly brilliant, and we must applaud his effort to break it down and explain it. He could never conceive most of this is the universe acting on the singularity.

Without the environmental context, the black hole doesn't exist. In the absence of interaction, it enfolds itself and voids its own existence. It doesn't even have the courtesy to evaporate locally let alone explode. It annihilates to everywhere leaving a dilated void only beginning to expand.

Dark matter is our generic term for matter that does not reflect or emit light. Unless we see an interaction, we honestly can't say what it is. When light passes through that space and gets distorted, we blame it on dark matter.

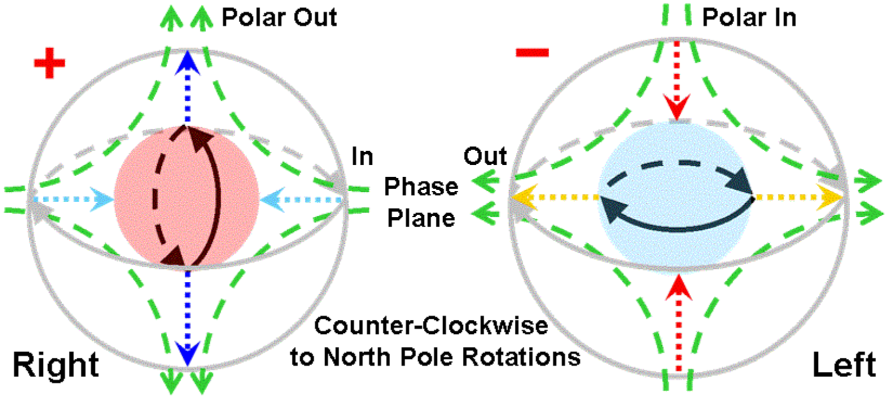
As we just noticed, this dark matter isn't actually there. It was. It somehow got twisted out of the Occam's Cycle. When we look back into the universe and see a kaleidoscope like the one on the cover twisting a deeper field, we are looking through a twist in the cycle.

The twist is between us and the cluster MACS J0416.1-2403 at z=0.397.[44] That is practically next door when CN-z11 is at z=11.1. We don't call it Quantum Shade for being out in the open and bright.

Vortices

Vortices are described as "whirling" and spiral-shaped; generally in terms of matter whirling around as in cyclones, tornados, hurricanes, etc. This term is often used to describe quantized angular momentum (QAM)—a state of particles rotating in a circular motion around a common origin.[45]

Vortex conditions can be static (strictly circular) or dynamic (degrading toward the center or evolving away from the center). The term vortex best describes a dynamic system.[46] Singularities are relatively static. The dynamics are always the environment acting on the singularity. We assume a temporal phase space vortex around a black hole.



From a cosmic perspective, space and time are flat. As we will see over the next two chapters, flat spacetime is constructed from change interactions. Applying a quantized change function to a segment of flat spacetime cause differentiation of the change functions—they unwind.

[44] Jauzac, M. et al. (Oct. 22, 2014). Hubble Frontier Fields: The Geometry and Dynamics of the Massive Galaxy Cluster Merger MACSJ0416.1-2403. https://arxiv.org/pdf/1406.3011.pdf.
[45] Nave, C.R. (2017). Quantized Energy States. Georgia State University. http://hyperphysics.phy-astr.gsu.edu/hbase/Bohr.html.
[46] Ting, L. & Klein, R. (1991). Viscous Vortical Flows. Springer Berlin Heidelberg.

Flat spacetime easily defines a volume in two or three axes. A singularity creates a volume with one axis. Its presence takes that axis out of the local phase definition leaving a sinusoidal change dynamic flattened in time. As helical time unravels, the orbital twists of matter around the singularity exaggerate.

The result is a context-sensitive vortex around the singularity that respects its polar and equatorial strengths. The rotational rate of the vortex is determined by the relationship between the matter of that phase space and the singularity it is nucleated to.

Such a rotation would be a function of quantized angular momentum (QAM). QAM can reasonably be argued as a means to twist as a function of field mechanics a black hole into existence—an Occam's Cycle twist. Since such a singularity is confined in its QAM environment, it seems safe to find a way to create the necessary QAM twists and reconstruct micro-singularities.

Quantum Field Theory

Spacetime tells matter how to move; matter tells spacetime how to curve.

—John Archibald Wheeler on gravity, 1998
Geons, Black Holes, and Quantum Foam

Change-Color Truth Tables

Entropies to **Colors**

×	j	h	i	$\hat{j}$	$\hat{h}$	$\hat{\imath}$
j	–1	$\hat{\imath}$	$\hat{h}^2$	0	i	$\hat{h}^2$
h	$\hat{\imath}$	–1	$\hat{j}$	$\hat{\imath}$	0	$\hat{j}$
i	$\hat{h}^2$	$\hat{j}$	–1	$\hat{h}^2$	j	0
$\hat{j}$	0	$\hat{\imath}$	$\hat{h}^2$	+1	i	$\hat{h}^2$
$\hat{h}$	i	0	j	i	+1	j
$\hat{\imath}$	$\hat{h}^2$	$\hat{j}$	0	$\hat{h}^2$	j	+1

×	r	g	b	c	m	y
r	–1	y	m	0	b	m
g	y	–1	c	y	0	c
b	m	c	–1	m	r	0
c	0	y	m	+1	b	g
m	b	0	r	b	+1	r
y	m	c	0	g	r	+1

Permittivity & Permeability Constants

Legend:

ε = Permittivity (energy application/potential)
$\acute{\varepsilon}$ & μ = Permeability (energy flow)

0 = Maxwell's magnetic constants
L = Newtonian linear/gravity constants*
A = Coulomb's angular constants
S = Planck's spin constants
V = Vector axis relational constant*

Permittivity		
Symbol	**Constant**	**SU**
$\varepsilon_0=1/\mu_0 c^2$	3.54167512704815E-25	kg/m^3
$\varepsilon_L=\varepsilon_S/\varepsilon_A\varepsilon_V$	4.68756541267341E+17	kg/m
$\varepsilon_A=1/4\pi\varepsilon_0=k(\varepsilon)$	2.24688794684204E+23	m^3/kg
$\varepsilon_S=c^2/\dot{\varepsilon}_S$	8.52246609859054E+50	/kg s
$\varepsilon_V=\varepsilon_S/\varepsilon_L\varepsilon_A=2\sqrt{2}$	2.82842712474619E+00	/m^2 kg s

Permeability		
Symbol	**Constant**	**SU**
μ_0	3.14159265358979E+07	m s^2/kg
$\acute{\varepsilon}_L=G=c^2/\varepsilon_L$	6.70197080364171E-11	m^3/kg s^2
$\dot{\varepsilon}_A=c^2/\varepsilon_A$	4.00000000000000E-07	kg/m s^2
$\dot{\varepsilon}_S=\hbar$	1.05457172646947E-34	kg m^2/s
$\acute{\varepsilon}_V=\acute{\varepsilon}_S/\acute{\varepsilon}_L\acute{\varepsilon}_A=1/\varepsilon_V c^2$	3.93381199861553E-18	kg s^3

* Explanation on pg. 72 et seq..

Change Functions

Einstein used new variables and language to evolve the field concepts of Poisson and Gauss into the more contemporary thinking of Riemann and Ricci-Curbastro.[1] His evolution helped solve the old thinking problems, and created its own list of unforeseen new problems.

Our concern is the Quantum Mathematical Language (QML) needed to explain the architecture and its field theory. In this chapter we will declare and define change functions (entropies, see pg 46). They help us construct relativistic spacetimes from confined (hidden) quantum perspectives.

Entropies

Entropies use Boolean logic OR (ȷ), AND (ɩ), BOTH/NOT (ɦ/t) truth concepts.[2] These concepts have a wide array of applications such as complex and hypercomplex solutions to √–1 and from their chiral forms, creating real numbers.

Complex and hypercomplex solutions are often described as imaginary. We would prefer the word **virtual** because it conveys better into the language to form and evolve matter. Images are real where light converges and virtual where light diverges.[3] Likewise with matter, real consists of a stable convergence where virtual is unstable subject to divergence.

Leonhard Euler (1707–83) developed the familiar imaginary number (ɩ=√–1) into a system of complex variables to relate algebraic and polar axes (constructing ordinary spaces).[4] He did this based on context without any evidence of a logical explanation of HOW $ɩ^2$ becomes –1. We will use similar illustrative methods with graphical applications later.

---

[1] Vasconcellos, C.A.Z. (editor). (2016). Centennial of General Relativity: A Celebration. New Jersey: World Scientific.

[2] Zimmer, S. (Jun. 30, 2017). What is a Boolean Operator? Alliant International University Library. https://library.alliant.edu/screens/boolean.pdf.

[3] Pumplin, J. (2000). Images Real and Virtual. https://web.pa.msu.edu/courses/2000fall/PHY232/lectures/lenses/images.html

[4] Sachs, R. (2011). Euler's Formula for Complex Exponentials. math.gmu.edu/~rsachs/m116/eulerformula.pdf.

Tessarine and quaternion truth tables devised later have a mutual problem: contextual validity with no tangible explanation HOW. Quaternions are asymmetric, making sequence important so ji=–ij. In all three, ij=k or –k.[5] Cockle's tessarines are symmetric (ij=ji) and use $j^2=+1$.[6] Contemporary tessarines are $j^2=-1$.[7]

Asymmetric — Quaternions (Hamilton)

×	j	k	i
j	–1	i	–k
k	–i	–1	j
i	k	–j	–1

Symmetric — Tessarines_O (Cockle)

×	j	k	i
j	+1	i	k
k	i	–1	–j
i	k	–j	–1

Symmetric — Tessarines_N (Negulescu)

×	j	k	i
j	–1	i	–k
k	i	+1	j
i	–k	j	–1

Around 1847, George Boole (1815–64) devised the system of syllogistic logical operator concepts of OR, AND, and BOTH/NOT.[8] NOT (t) is excluded here. Although ideal for the task, this logic was never used to explain HOW operators work in truth arguments like tessarines and quaternions.

This was resolve by accident of technological necessity substituting j for ±. By making ± a unit variable operator, it acquired the logical qualities of Boole's OR, inverting roles (flipping signs) every operation. AND was applied to ı, but only inverts in multiples (as with ɦ). To accommodate BOTH as a third solution (ɦ²=ıȷ=–1), negative comes first ı=–&+.

Boolean	Symbolic Logic				Entropy	Topology	
AND	x & y	x ∧ y	Kxy	XAND	*i*	tetrahedron	z
OR	x | y	x ∨ y	Jxy	XOR	*j*	circle	x
NOT	\ x	¬ x	Ix | Nx	NOTX	t	flat	t
BOTH	x ǁ y				ɦ	sphere	y

Among tessarines and quaternions, k=ij or –k=ij. This is an extremely limiting approach. We need the root ±k≡ɦ²=ıȷ. The hypercomplex variable can be reached other ways as well,

[5] Krishnaswami, G.S. & Sachdev, S. (Jun. 2016). Algebra and Geometry of Hamilton's Quaternions. http://www.ias.ac.in/article/fulltext/reso/021/06/0529-0544.

[6] Cockle, J. (1848). On Certain Functions Resembling Quaternions and on a New Imaginary in Algebra. Philosophical Magazine and Journal of Science. pg 436. https://www.biodiversitylibrary.org/item/20157#page/450/mode/1up.

[7] Negulescu, V.L. (May 2, 2015) Hyper-Complex Numbers in Physics. http://article.sapub.org/10.5923.j.ijtmp.20150502.03.html.

[8] Norman, J. (Jan. 23, 2018). George Boole Develops Boolean Algebra. www.historyofinformation.com/expanded.php?id=565.

such as $2\hbar^2=\imath^2+\jmath^2\equiv 2(\jmath x+\imath y)/z$, etc. Our entropy operators are not just features of a truth table. They are multi-functional.

Into Color

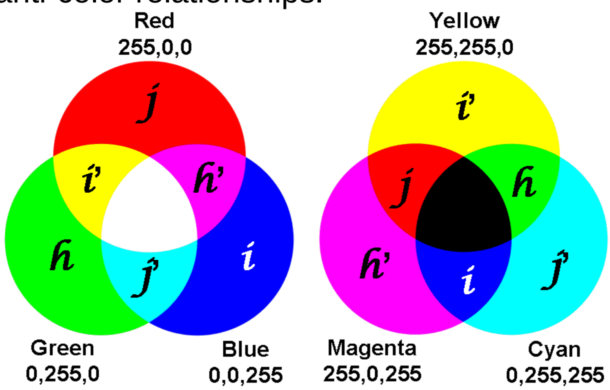
Having two more complex operators proved incredibly helpful in a broad range of applications. Everything about these operators is extremely ambiguous, so errors are easy. Fortunately, colors offer a real world analog. Most of how we describe, interpret, and otherwise define reality is fallible. It all goes out the window as soon as our understanding increases. Empirically established facts, however, never change.

Colors are more than just a metaphor for strong interactions. Handled properly, they show us everything we need to know about particle interactions and hadronization. They were selected for exactly the qualities they exhibit on the artist's pallet when mixed together. For a quantum truth table, this is a watershed victory because we can show it in the ordinary world and let nature resolve the ambiguities.

COLORS		
Red	r	ȷ
Green	g	ı
Blue	b	ħ
White	rgb	K

ANTI-COLORS			
Anti-red	$\bar{r}$=c	ȷ'	Cyan
Anti-green	$\bar{g}$=m	ı'	Magenta
Anti-blue	$\bar{b}$=y	ħ'	Yellow
Black	cmy	K	

Chromodynamics normally uses colors and anti-colors using the same symbols but with a bar across the top. We will use the subtractive cmy=k colors as anti-colors for purposes of visualization. You do still have to remember the r-c, g-m, and b-y color anti-color relationships.



Additive Colors Subtractive Anti-colors

Color palates show how colors and anti-colors mix with their own kind to produce their opposites.[9] If two colors interact, the nature of their interaction is provided by the anti-color of their intersection. Degree of intersection distinguishes different types of interactions. As such, the color truth table is vital to how all particles are put together.

For readability, additive color only is used in the text. Negative and inversion cause different orientation changes. Orientation is easily confused with the chiral anti-function. The chiral forms are thus shown with a prime: ȷ’, ν’ and μ’, etc.

Entropies to Colors

×	j	h	i	j'	h'	i'
j	–1	i'	h'	0	i	h'^2
h	i'	–1	j'	i'	0	j'
i	h'	j'	–1	h'^2	j	0
j'	0	i'	h'^2	+1	i	h'
h'	i	0	j	i	+1	j
i'	h'^2	j'	0	h'	j	+1

×	r	g	b	c	m	y
r	–1	y	m	0	b	m
g	y	–1	c	y	0	c
b	m	c	–1	m	r	0
c	0	y	m	+1	b	g
m	b	0	r	b	+1	r
y	m	c	0	g	r	+1

These two tables are symmetrical: ıȷ=ȷı (or br=rb). They say exactly the same thing in two different ways. The first uses the entropy containers represented by the mathematical operators. The second uses the colors of chromodynamics. For comparison, all the truth tables in this section are arranged rgb.

These tables are much bigger than their predecessors because we have three specific conditions. In the predecessors we see negative like –j. The analysis showed there are two possible chiral conditions for this variable. In one condition, ȷ is simply rotated and looks like ȷ’ except it isn’t ȷ’. Rotating does not change the identity.

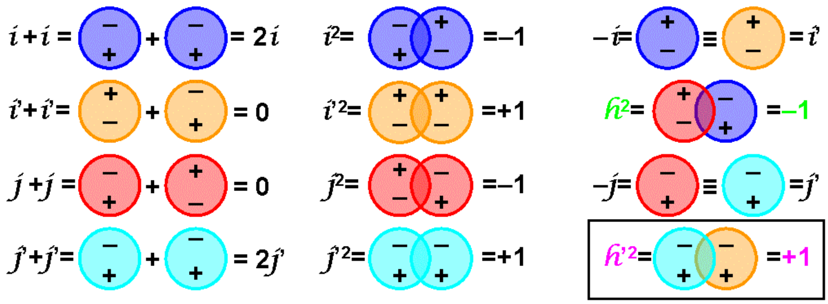
Venn Algebra

Venn diagrams[10] are taught in various logic courses like algorithms and symbolic logic. They offer a mechanical way to visualize the concepts of sets, including subset, superset, and

[9] Brown, A. & Feringa, W. (2003). Colour Basics for GIS Users. Harlowe, England: Pearson Education Limited.
[10] Stapel, E. (2017). Venn Diagrams. purplemath.com/modules/venndiag.htm.

the interactions of sets. For now, let us see how our operators function in an applied mathematical way by Venn visuals.

Aside from the logical AND, OR, and BOTH features, the operators will invert their signs contextually. Between color and anti-color entropies, when they invert also gets inverted (see rule table pg. 59). This is easiest to see in the counter-intuitive ƙ+ƙ=0 of ȷ, ɦ', and ı'. The opposite for these is also true: ƙ–ƙ=2ƙ.



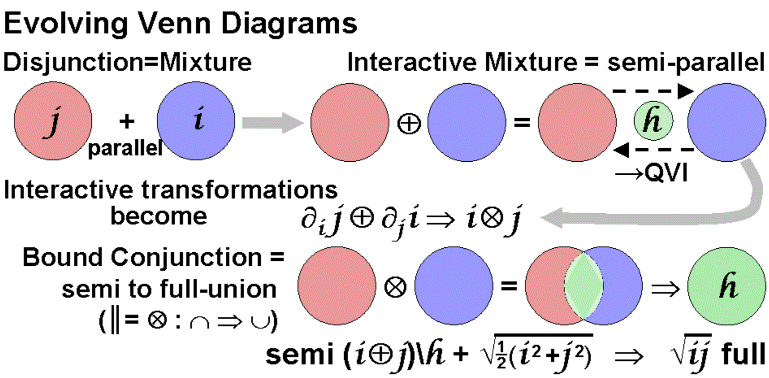
Hypercomplex ɦ is also known as phase entropy. The simplest definition is ɦ²=ıȷ. While simple, this hides the fact that ı and ȷ make up ɦ by being irrational: ɦ²=–ı/ȷ. This causes the axis positions of ı and ȷ to align as needed to form ɦ. It also rationalizes and provides anti-phase: ɦ'²=ıȷ'=–ıȷ =ȷ'/ı' or

(–|+)/(+&–)=(–|+)(–&+)=(+&|+)
showing –ȷ≡1/ȷ'; –ɦ≡ɦ'; –ı≡ı'.

For basic algebra, as with chromodynamics, these equivalences can be treated as equal quantum numbers (units). The issue we have with ±k=ij is relative magnitude. Relative to ȷ=1, ı=e. This creates a red-blue and cyan-yellow bonding limitation for QCD.

Phase (ɦ=e to ȷ≡ı=1) is a higher class of change function. It sees unit equivalence allowing a single bond with one (rg, bg, cm, my=Type I Weyl fermions) or both (rgb or cmy=Type II Weyl fermions). Both can only be done simultaneously. We will see later how these combinations define volumes by axial rotations (pg. 83 et seq.).

Time emerges from ȷ and ı interactions of the same magnitude (1:e), but inconsistent without phase ɦ. Phase sees them as the same magnitude because of its own construction. To bond ı and ȷ to form ɦ they must be the same unit value. This means ȷ is a higher magnitude to be equal in scale to ı.



If we have a mixture of $\imath$ and $\jmath$ (simple addition=+), the two can interact and pass through the same space. Separately, their axes define surfaces. In degrees of interaction (inner sum), a transient (weak) field cannot distinguish surface from volume and applies value to both. Full interaction is strong resulting in just a volume.

The partial derivatives (∂) are $\jmath$ and $\imath$ transforming into each other. They are smoothing into a common state of proportional (1:e) equilibrium. This is the change root of manifolds smoothing from an anomalous atlas (point distribution[11]). Vector energy follows. The lead is scalar energy adjusting value to equilibrium (2nd Law of Thermodynamics[12]).

The prevailing/dominant entropy condition of a set (e.g. the super set conditions) is its phase identity. Changes to phase identity affect the parts (quantum fluctuation, see pg. 43 et seq.). This is shown as an inner product function. The inner product is like the inner sum. Only parts are involved, while the rest is excluded.

Normally, we apply operators assuming all of each variable participates, like 6×4=24 and 4+5=9. The algebra of Venn logic is ambiguous. Just because you have 6 of one and 4 of another doesn't mean you are going to use all those parts, or necessarily use them in the same ways. It is like baking a cake: in theory you didn't use everything in the kitchen.

When we complete our evolving operation, the total scalar value of ɦ is equal to that of $\imath$ or $\jmath$. This leaves half the scalar

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[11] Welbourne, E. (Mar. 18, 2017). Atlases and Charts of Smooth Manifolds. http://www.chaos.org.uk/~eddy/math/smooth/atlas.html.

[12] Redner, S. (2006). Equilibrium and the Second Law of Thermodynamics. http://physics.bu.edu/~redner/211-sp06/class-macro-micro/2nd-law.html.

value of the original parts as excess: (ı+ȷ)\ɦ reads the mixture of ı and ȷ not (\) in ɦ. That NOT is a time variable. We can change the identities of quantum particles simply by changing their phase identity. Neutrino "oscillation"[13] is typically due to energy changes temporarily also granting them mass.

Algebra

In algebra our operators are fairly simple: $(ɦ|ı|ȷ)^2=-1$ and $(ɦ'|ı'|ȷ')^2=+1$. Color entropies are imaginary ($\sqrt{-A^2}=ƙA$) and anti-colors are REAL ($\sqrt{A^2}=ƙ'A$). Our operators easily disappear into any unit. If an operator is present, there is also quantization specifying its application. In algebra, we don't worry so much about those specifics.

<table>
<tr><th rowspan="2"></th><th rowspan="2">Primary</th><th rowspan="2">Boolean Operator</th><th rowspan="2">Secondary</th><th colspan="2">Alternates</th><th colspan="5">Applied</th></tr>
<tr><th>Sum</th><th>Product</th><th>ƙ²</th><th>ƙ+ƙ</th><th>ƙ–ƙ</th><th>Relative</th><th>(x+ƙy)²</th></tr>
<tr><td>ɦ</td><td>ı</td><td>BOTH</td><td>ȷ</td><td>n</td><td>n</td><td>–1</td><td>2ɦ</td><td>0</td><td>√ıȷ=√–ı|ȷ=ı'|ȷ</td><td>x²+2ɦxy–y²</td></tr>
<tr><td>ı</td><td>–</td><td>AND</td><td>+</td><td>n</td><td>y</td><td>–1</td><td>2ı</td><td>0</td><td>√–ɦȷ=ɦ|ȷ'=ȷ|ɦ'</td><td>x²+2ıxy–y²</td></tr>
<tr><td>ȷ</td><td>+</td><td>OR</td><td>–</td><td>y</td><td>y</td><td>–1</td><td>0</td><td>2ȷ</td><td>√–ɦı=ɦ|ı'=ı|ɦ'</td><td>x²–y²</td></tr>
<tr><td>ɦ'</td><td>ȷ'</td><td>BOTH</td><td>ı'</td><td>y</td><td>y</td><td>+1</td><td>0</td><td>2ɦ'</td><td>√–ıȷ=√ı'ȷ'=ȷ'|ı</td><td>x²+y²</td></tr>
<tr><td>ı'</td><td>+</td><td>AND</td><td>–</td><td>y</td><td>n</td><td>+1</td><td>0</td><td>2ı'</td><td>√ɦȷ=ɦ'|ȷ=ȷ'|ɦ</td><td>x²+y²</td></tr>
<tr><td>ȷ'</td><td>–</td><td>OR</td><td>+</td><td>n</td><td>n</td><td>+1</td><td>2ȷ'</td><td>0</td><td>√ɦı=ɦ'|ı=ı'|ɦ</td><td>x²+2ȷ'xy+y²</td></tr>
</table>

All entropies are at least complex operators differing by Boolean function and when they alternate signs. Only right handed ȷ and ȷ' alternate with each operation.

The table above provides a generic way to analyze the qualities of these operators without ambiguities. As you can see, some of these qualities make finding the roots of certain functions, like x^2-y^2 or x^2+y^2 fairly easy.

They can also be used to analyze quadratic functions as shown below. This of course assumes the axes involved are functions of the entropies. Each entropy affects a different axis. We will get to that soon.

[13] Casper, D. (1998). Neutrino Oscillations. ps.uci.edu/~superk/oscillation.html.

$ax^2+bx+c=0$ if $4ac>b^2$ then $\bar{k}=\hbar^2$ else $\bar{k}=\hbar'^2$

Multiply through by 4a $4a(ax^2+bx+c=0)$

$4a^2x^2+4abx+4ac=0$

Isolate 4ac $4a^2x^2+4abx=-4ac$

Add b^2 to both sides $4a^2x^2+4abx+b^2=b^2-4ac$

Take root and apply $\bar{k}$ $2ax+b=\jmath\sqrt{\bar{k}}(b^2-4ac)=u$

For $4ac\le b^2$ = r-phase $=\jmath\sqrt{(b^2-4ac)}$

For $b^2<4ac$ = z-phase $=\jmath\sqrt{(4ac-b^2)}$

Giving a generic $x=\frac{u-b}{2a}$

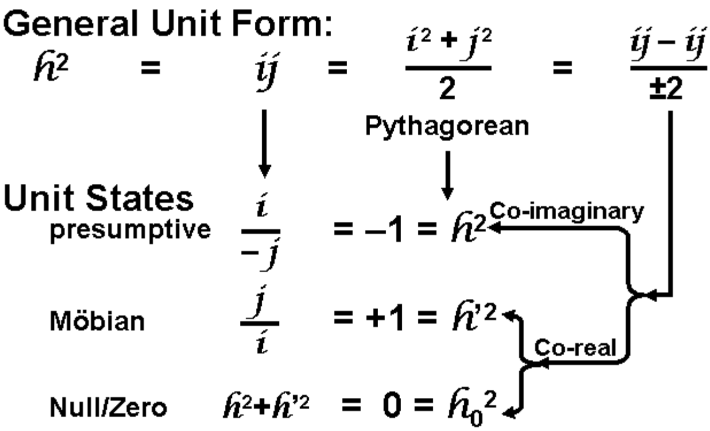
The generic foils and roots identities also assume we apply the right axes. The most baffling and algebraically useful feature of $\jmath$, $\hbar'$, and $\imath'$ is their counter-intuitive zero sums (e.g. $\jmath+\jmath=0$) and doubled differences ($\jmath-\jmath=2\jmath$). We could make the list considerably longer, but that would belabor the point.

Imaginary Foils/Roots

1. $(A\pm B)^2=A^2\pm 2AB+B^2$
2. $(A-\jmath B)^2=A^2+2\jmath AB-B^2$ always $(A+\jmath B)^2=A^2-B^2$
3. $(A\pm\imath B)^2=A^2\pm 2\imath AB-B^2$ $(\imath A+\jmath B)^2=-A^2-B^2$
4. $(A\pm\hbar B)^2=A^2\pm 2\hbar AB\mp B^2$
5. $(\imath A+\jmath B)^2=(\hbar C)^2\Rightarrow\hbar^2=\frac{A^2+B^2}{C^2}$ never $(ABC)^2=\frac{\imath^2+\jmath^2}{\hbar^2}$
6. $2\hbar^2=\imath\jmath-\imath\jmath=\imath^2+\jmath^2$
7. $2\jmath=\jmath-\jmath=-2\imath\hbar^2=-\imath(\imath^2+\jmath^2)$ note $0=\jmath+\jmath$
8. $\sqrt{\jmath}=\hbar\sqrt{-\imath}\equiv\sqrt{-\imath}$ and $\sqrt{\imath}=\frac{\sqrt{-\jmath}}{\hbar}\equiv\sqrt{-\jmath}$

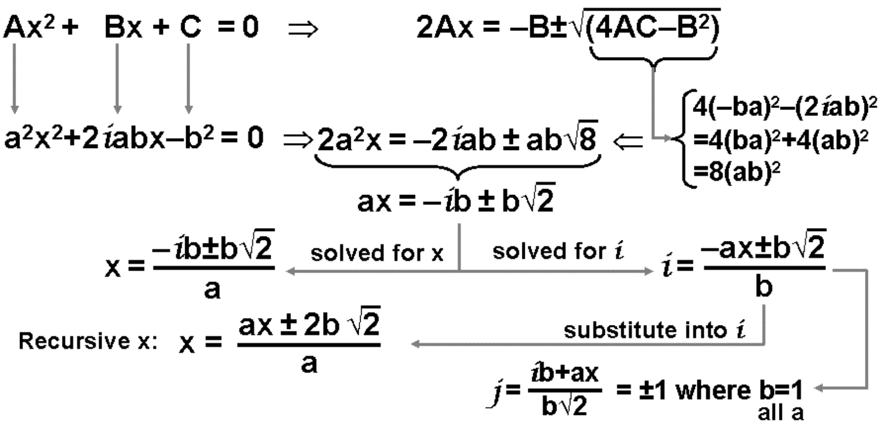
$\imath=(a+\imath b)^2$ but $\hbar z=\jmath x+\imath y\Rightarrow\sqrt{\imath=\frac{x^2+y^2}{\jmath z^2}}\equiv\sqrt{-\jmath}$

One of our greatest challenges is finding exactly which operator applies to what. For example, $\imath A+\jmath B\equiv\jmath A+\imath B$. In algebra, we are pretty much just going through practice moves, so very likely we don't care. We do, so we will get to what exactly these operators can apply to. For algebra, we need to understand how they relate to each other.



We can also use a quadratic approach:

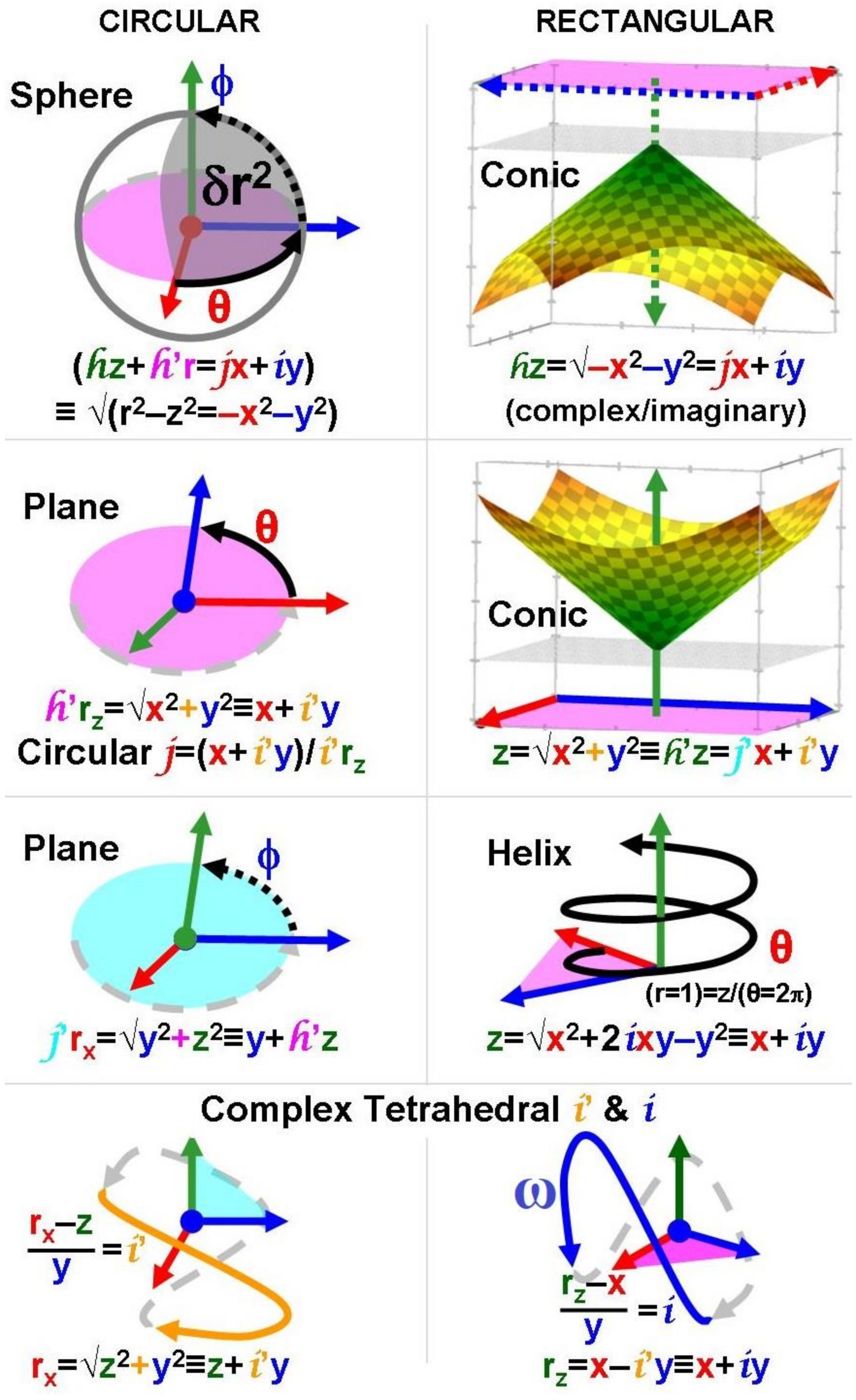
Quadratic Rationalization of i in $(ax+ib)^2=0$



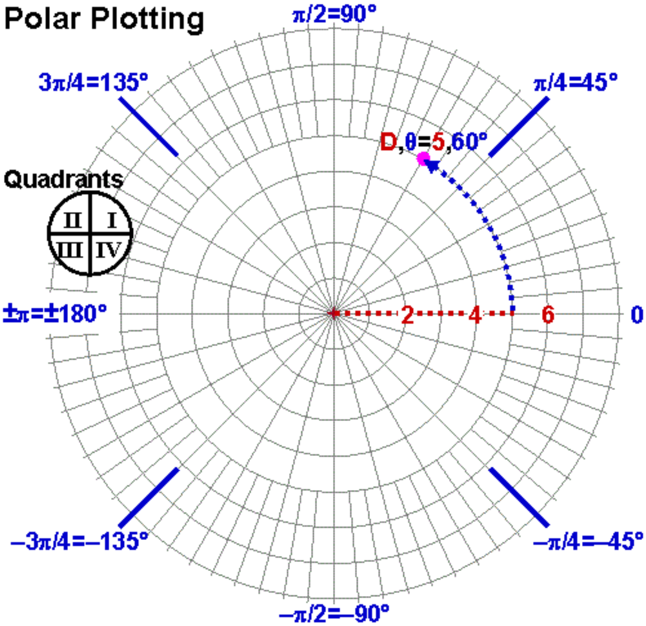
It seems unreasonable to go into too much detail on the anti-entropies at an algebraic level. It is easy enough just following the rules, but perhaps more information than is reasonable without a lot of application. Often such applications are hiding in plain view. Problem is understanding them enough to interpret and make testable predictions.

Context Graphs

The graphs below show various ways to apply complex and hypercomplex operators (entropies) to different types of ordinary functions. The second column does things Euler's way: using xyz rectangular/linear axes. The first column recognizes that sometimes a scalar radius occurs instead of a linear axis, or with the linear axes.


CIRCULAR
RECTANGULAR
Sphere
φ
δr²
θ
(ℏz+ℏ'r=jx+iy)
≡ √(r²–z²=–x²–y²)
Conic
ℏz=√–x²–y²=jx+iy
(complex/imaginary)
Plane
θ
ℏ'r_z=√x²+y²≡x+i'y
Circular j=(x+i'y)/i'r_z
Conic
z=√x²+y²≡ℏ'z=j'x+i'y
Plane
φ
j'r_x=√y²+z²≡y+ℏ'z
Helix
θ
(r=1)=z/(θ=2π)
z=√x²+2ixy–y²≡x+iy
Complex Tetrahedral i' & i
(r_x–z)/y = i'
ω
(r_z–x)/y = i
r_x=√z²+y²≡z+i'y
r_z=x–i'y≡x+iy

Polar Refresher



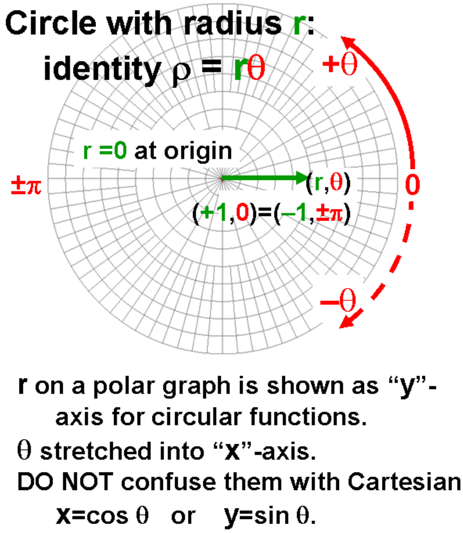
To plot a point (5,60° shown):

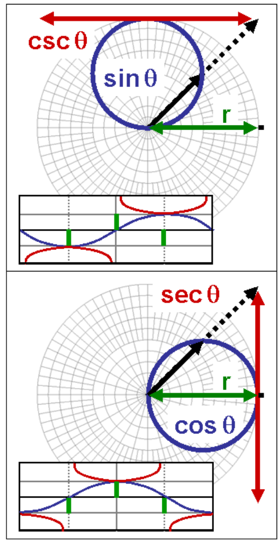
1. Assign length values to the circles.
2. Find the angle (straight lines intersecting the origin). Positive angles are counterclockwise, negative angles are clockwise.
3. Measure the distance from the origin along the straight line relative to the circular distance markers. Positive distance goes toward the angle, negative away from the angle.

The coordinate is represented as a single item by the Greek letter rho (ρ). If the above were ρ=–5,60°, then the point would be in the third quadrant and equal to 5,–120° or 5,240° depending on which direction you go. This is important because trigonometry functions are technically circular and should be plotted in polar coordinates.

Sine and cosine draw circles (below): sine in quadrants I & II, cosine in I & IV. These circles aren’t just drawn once. They are drawn twice in the same places because of the negative values. If we used absolute values of these functions, we would see both circles for each.

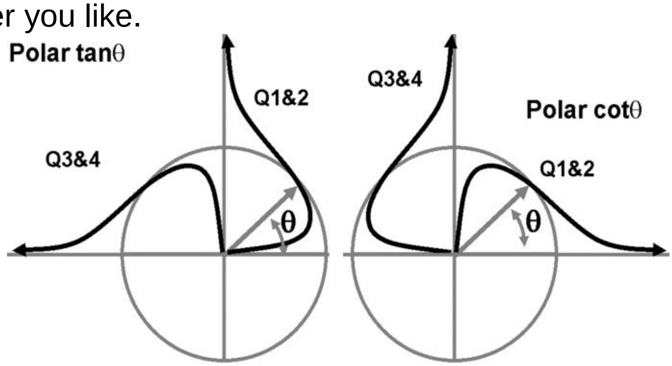
The insets of the polar graphs for sine and cosine are the conventional/common way the functions are depicted. As we discussed in Color Geometry, these graphs are useful for measuring related magnitudes of spacetime density. We also mentioned that the positive radius value (y-axis shown in green) need not have the same magnitude as the negative. Whatever the magnitudes of these are, they a quantified, meaning they have been reduced to a single unit.



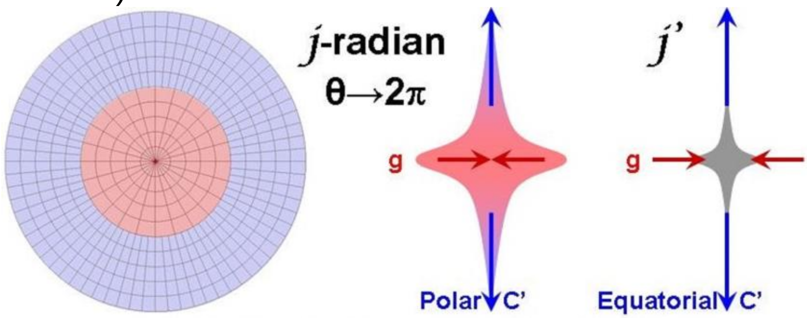


The x,y axes of the common depiction are confusing to students. They aren't actually x and y. The x-axis is the angle called the radian (shown in circumference increments of π). Without a radius, the length of this line is technically zero.

Because the radian marks are constant, we use a unit circle (radius=1) and fix the increments of the x-axis. The y axis value is the linear distance from the origin. As with other rectangular systems, you can assign value to the tick marks however you like.

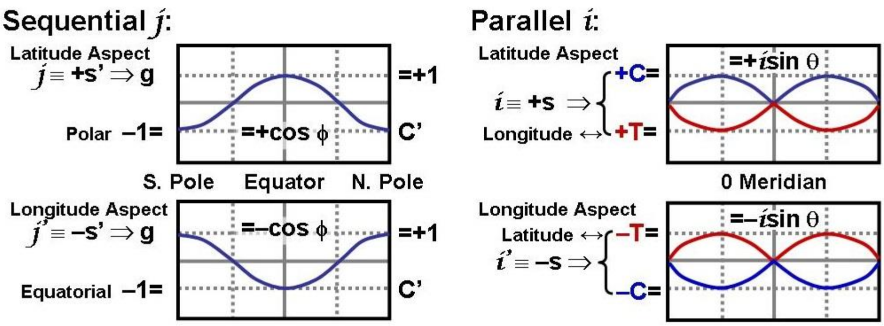


Entropies also serve as radians due to change being cyclic. This is how circular planes form from ȷ as flat (shown above as θ) and ı as tetrahedral (ω=sinusoidal/S-shaped, lower right of above diagram). Both have the same radian length (2π) and combine to form a spherical radian (shown above as δ) in ɦ of $\theta^2+\omega^2=2\delta\rightarrow8\pi$.



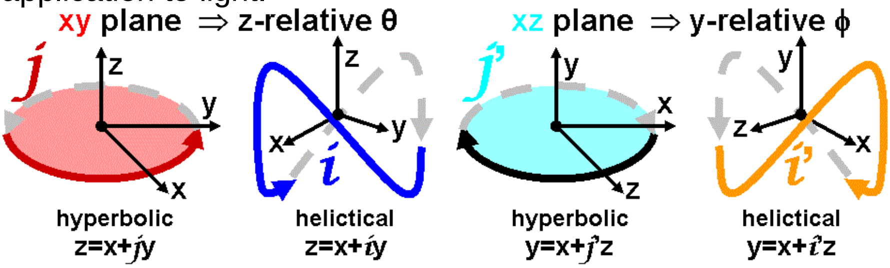
Flat Radian to Cross-Section Profile

In the polar graph above, red is gravity and the blue centrifugal plane is at a right angle to the red. The result in a cross-section profile appears complex. Gravity is a contracting spacetime (+) and centrifugal is expanding (–). Taken as unit values the conversion from one to the next is cosine.



Where ȷ vectors are sequential, ı vectors are simultaneous and working against each other (e.g. left handed). The ı radian (ω) is only useful for showing these fields forming their plane. It is important to remember the vectors of ı and ȷ are linear and angular, which draws each of these spaces accordingly.

The ı and ȷ planes are special purpose applying as ideal only in Abstract Phase. That covers every extra-temporal interaction, such as shaping Quantized Vector Interactions (QVI), which corresponds with mapping energy distribution through a microstate sequence, and their Quantum Shade application to light.



Light “sees” the plane in profile—or more accurately can’t see it. To it there is an unimpeded space. The propagation is temporal, responding to the shaping of these surfaces coming into phase, and recognizing occupancy. This gives us both gravitational lensing and its related kaleidoscope effect.

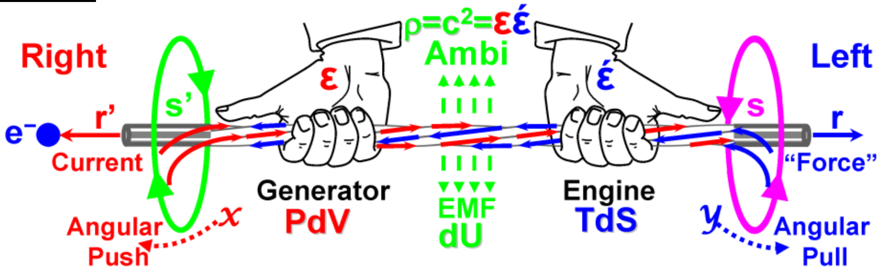
Quantum Forces

Scalar energies are fundamental forms of magnitude more familiarly known by mechanical and light wave propagations. We will call them forces. As a ranged interaction, forces transfer by means of permeation—applying value to spaces. The most popular way to convey scalar energy is by particle carrier due to focus (order).

We habitually put everything in particle perspective. Forces provide basic magnitudes to value the spaces and fields of matter. Without focus of a change function, force propagates as disorder. Disorder is shaped by ι into a transverse wave without spatial or temporal definitions of its own. A focus of force forms a virtual particle (order).

Virtual means quantum (uncertain) and transient.[1] Gauge bosons shuffles energy around in a series of microstates generally defining surfaces, but occasionally volumes. This leads to the Heisenberg uncertainty principle and arguments of whether these are particles, waves, or to just conjoin the words as wavicles. These are transient particles until confined in interaction making them relativistic.

Waves



Fleming's right and left hand rules show force directions in a complete process.[2] Linear forces are r' and r; angular are x and y; spins are s' and s. The spins always exist with their

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[1] Jones, G.T. (2002). The uncertainty principle, virtual particles and real forces. hst-archive.web.cern.ch/archiv/HST2005/bubble_chambers/BCwebsite/articles/06.pdf.

[2] Daware, K. (2014). Fleming's Left Hand Rule And Right Hand Rule. http://www.electricaleasy.com/2014/03/flemings-left-and-right-hand-rule.html.

angular and linear values losing their identities (order) to roles as radiant (EMR) and absorption (EMA) disorder.

$$Ax^2+Bx+C=0 \qquad x=\frac{-B\pm\sqrt{B^2-4AC}}{2a}$$

$$x^2\pm 2yx+y^2-c=0 \qquad x=\begin{cases}\dfrac{\mp 2y\pm\sqrt{4y^2-4(y^2-c)}}{2}\\[2ex] \dfrac{\mp 2y\pm 2\sqrt{y^2-y^2+c}}{2}\\[2ex] \boxed{\mp y\pm\sqrt{c}}\end{cases}$$

Linear, spin, angular, right and left are specified for exactly the same reasons we specify A, B, and C in a quadratic evaluation: to identify which scalar applies to what. As parts of the same function, which has Pythagorean and quadratic applications, the values are related in the same identity. They have distinct and separate applications with a change function, but in the rough as EMR or EMA are indistinct.

Classical $$F = \underset{\text{relativistic}}{ma} = \left(\frac{mv}{\Delta t}\right) \quad ; \Delta t = \left(\frac{r}{v}\right)^{\text{orbit}}$$

QF of spin (light) $$F_S{}^2 = \Delta F_L{}^2 + \Delta F_A{}^2 = \underset{\rho=\text{light surface}}{\rho}\left(\frac{\hbar}{c^2}\right)^2$$

Frequency $$\upsilon = \underset{\text{cycles / second}}{\left(\frac{F_S c}{h}\right)\left(\frac{1}{\sqrt{\hbar\varepsilon_V}}\right)} \equiv \underset{\text{attributed}}{\left(\frac{E=pc}{h}\right)}$$

Momentum $$\underset{\text{attributed}}{p_x} = \left(\frac{F_S}{\sqrt{\hbar\varepsilon_V}}\right) = \left(\frac{h\upsilon}{c}\right) = \left(\frac{h}{\lambda}\right) = \underset{\text{attributed}}{m_x v}$$

Classical force uses Newton units=kg m/s².[3] Quantum forces are presumptive scalars that can be converted into energy, momentum, and classical force easily as shown. Attributed is another word for virtual. Again, we assume virtual unless and until confinement establishes material identity.

Force conveys mechanically from one intrinsic field to another, or as light.[4] QCD colors (rgb) correspond with wave categories: intrinsic/ordered red (ȷ), disordered blue (ı), and quasi-ordered green (ɦ). Dashed arrow shows propagation

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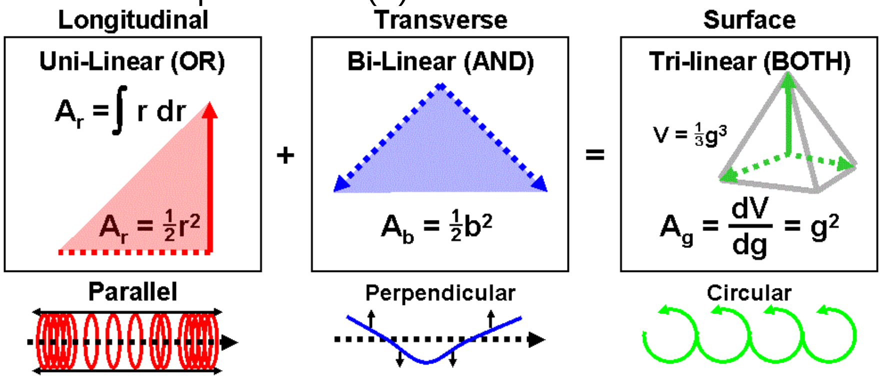
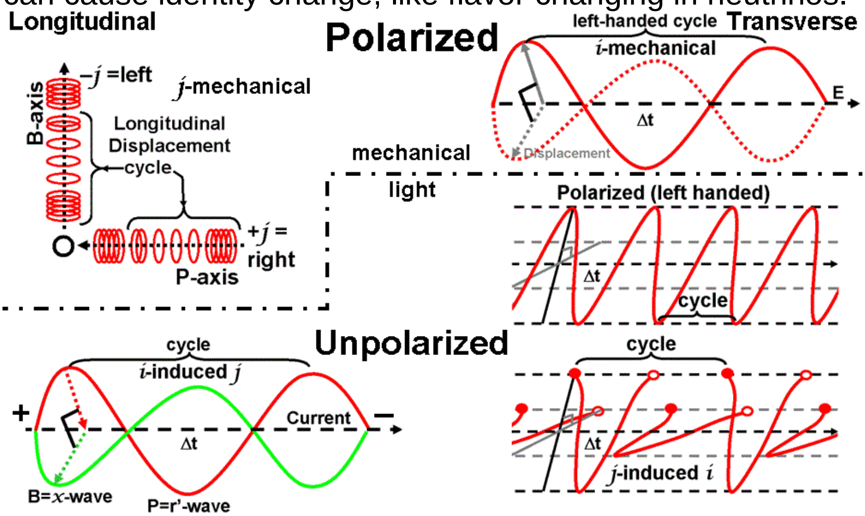
[3] (Oct. 1, 2014). SI Unit of Force. UK: National Physical Laboratory. npl.co.uk/reference/faqs/si-unit-of-force.

[4] Henderson, T. (2018). Categories of Waves. physicsclassroom.com/class/waves/Lesson-1/Categories-of-Waves

direction. Solid arrows show mechanical displacement. Force surface is the phase area (A).

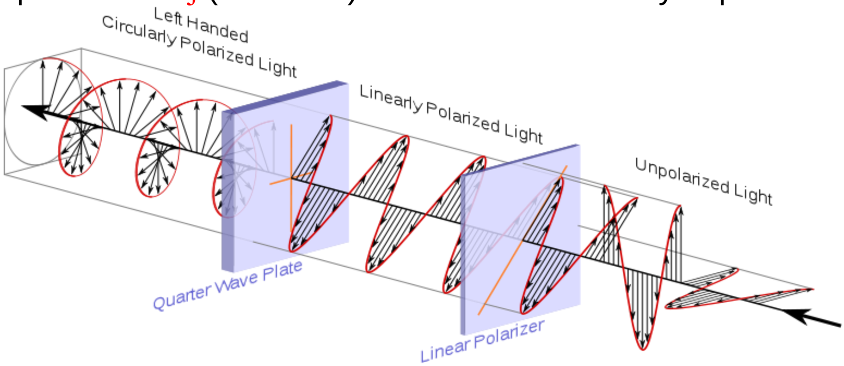


Light only conveys as a transverse wave (disorder). This limits force associations with light to linear r and angular y. As in all wave information, one force acts as emission (EMR) while the other acts as absorption (EMA). When this information acts on matter, it attempts to normalize with the intrinsic information of that matter. The result is oscillation that can cause identity change, like flavor changing in neutrinos.



Convention excludes longitudinal waves from polarization. It is included here because the energy can be going one direction or the other, which would be polarization. It is a chiral polarization though. Haar "right" (e.g. gravity, e^- current) and "left" (e.g. heat or electrical force) are angular-B (cyan) and linear-P (red) relative axes.

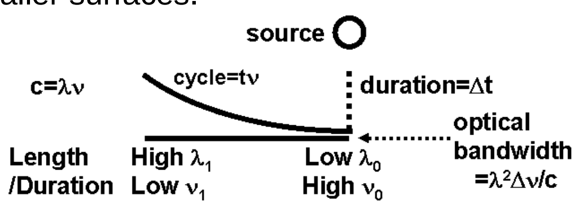
The diagram provides three types of transverse (light) waves: circular, linear, and unpolarized.[5] “Circular” is shown here as ɦ-unpolarized (ι induced ȷ) . A filter makes this “linear” = ι-polarized (an unequal pairing of ι =elliptical). Another filter depolarizes to ȷ (induced ι). These are commonly depicted:



Being without its own spacetime definition, light acts as a diverging field (signal/luminosity loss and drift[6]). Each point in that field, barring interference, contains the same shape and information. This is not photon entanglement. It is the common phase (moment) information of that field.

Divergence is a function of expanding void stretching the size of the points in the light field consistent with lengthening the wavelength. Those points can be interpreted in material terms as virtual photons with Planck’s $E=h\upsilon$.

Initial energy followed by propagation divergence stretches the wavelength (λ) widening the optical bandwidth ($\Delta\lambda=\lambda\Delta\upsilon/c$).[7] Optical bandwidth describes the surface of the wave. This surface passes through larger openings and around smaller surfaces.



[5] Erdogan, T. (2018). Understanding Polarization. Lake Forest, IL: Semrock, Inc. https://www.semrock.com/understanding-polarization.aspx.
[6] Rajaraman, R. (2010). Antennas & Propagation. Northeaster University. ccs.neu.edu/home/rraj/Courses/6710/S10/Lectures/AntennasPropagation.pdf.
[7] Paschotta, R. (2007). RP Photonics Encyclopedia: Bandwidth. Germany: RP Photonics Consulting. https://www.rp-photonics.com/bandwidth.html.

To capture a low-energy distribution, a surface can be porous if the holes are smaller than the optical bandwidth. The surface then reflects into focus or captures directly to observe.

Leaving an aperture open at length as to make a deep field observation increases the surface-time. The energy isn't accumulated all at once like a real photon, but instead accumulates to a virtual photon value.

These details are significant here because if light is to excite or otherwise modify matter, it has to be able to manifest in the available spaces of matter. Space availability depends on entanglements and available unused surfaces. Weak bosons have very little available, where photons are conveyed at the same speed not easily allowing for accumulation.

This brings us to something waves (light) and bosons have in common: unit spin. The surface unit (radius) is cut in half when it evolves into or is applied to a volume. A volume more fully occupies a space. The creation of a volume tends to fill quantum numbers (e.g. change axes), limiting the ability to share that space (Pauli exclusion principle).[8]

Bosons are transitional (virtual) particles. They have a unit of spin because their spaces are not fully constructed, even though weak bosons liberally use volumes. Bosons can conditionally pass through the spaces of other particles.

The same is true with light. The unit cycle in frequency is the spin corresponding with a change function: unpolarized s' with ȷ, polarized s with ı, and circular ρ with ɦ. Where things get awkward is in how much scalar value can occupy a space anyway. Of course that space has to be contained, so it isn't just a space, it is a spacetime.

Quantizing

Quantization is the act of acquiring the proportional values required for a unit identity. The values are evaluated relative to constants defining the boundaries of spacetime. Spacetime is quantized by filling the potential of a space and thereby fully occupying it—leaving NO void.

Spacetime quantization only applies to singularities. The constants, however, describe how values act on a space and

[8] Nave, C.R. (2017). Pauli Exclusion Principle. Georgia State University. http://hyperphysics.phy-astr.gsu.edu/hbase/pauli.html.

how a space reacts. Permeability (έ) defines how a type of value is applied to/acts on a space. Permittivity (ε) is how the space receives/interprets the value. See constants on pg. 52.

Achieving relativistic proportion boundary conditions is not as easy as it looks. The change containers need to evolve and normalize into ordered relativistic roles. Then you have to violate their use of space significantly to degenerate them toward being filled.

Each step up in material evolution optimizes the use of energy and space. These act mostly as boundary conditions and means to convert scalar energy values into various applications. One such application we will see is defining tensor manifolds as Lie functions (see pg. 97).

Traditionally, the terms permeability and permittivity are applied only to EM. We are expanding them to fit their linear, angular, and spin analogs, plus the vector axis relation as a modifier class (subset V explained below). This modifier and EM have the unique quality of forming a space that contains change (έε=1/c^2=ɩȷ/Δ). The others define space in a change container (spacetime) έε=c^2=Δ/ɩȷ.

G & the Vector Axis Modifier

The vector axis modifier makes a rather substantive adjustment to Newton's constant. There are a lot of issues with measuring G accurately from its long wavelength to interference of other fields including other forms of gravity.

G = 6.67384(80) E-11m^3/kg s^2 (CODATA, 2010)[9]
6.67408(31) E-11 m^3/kg s^2 (CODATA, 2015)[10]
6.67545 E-11 m^3/kg s^2 (Terry Quinn, BIPM, 2013)[11]
6.70197(08) E-11 m^3/kg s^2= $\hbar c^2 \mu_0$ √2/2π m^2 kg s

$\varepsilon(V)=2\pi G\varepsilon_0 /\hbar=4\pi G/\hbar\mu_0$ c=2√2/m^2 kg s is the modifier as a proportion of the other permittivities. The angular and spin

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[9] Mohr, P.J. et al. (2012). CODATA recommended values of the fundamental physical constants: 2010. physics.nist.gov/cuu/pdf/RevModPhysCODATA2010.pdf.
[10] Newell, D. (2015). CODATA Recommended Values of the Fundamental Physical Constants 2014. codata.org/blog/2015/08/04/codata-recommended-values-of-the-fundamental-physical-constants-2014/.
[11] Moskowitz, C. (Sep. 18, 2013). Puzzling Measurement of "Big G" Gravitational Constant Ignites Debate. https://www.scientificamerican.com/article/puzzling-measurement-of-big-g-gravitational-constant-ignites-debate-slide-show/.

axes become a spherical spacetime volume in change $(\hbar\mu_0 \rightarrow m\ s)c^2 \rightarrow m^3/s$. This is converted to rectilinear form ($/4\pi$).

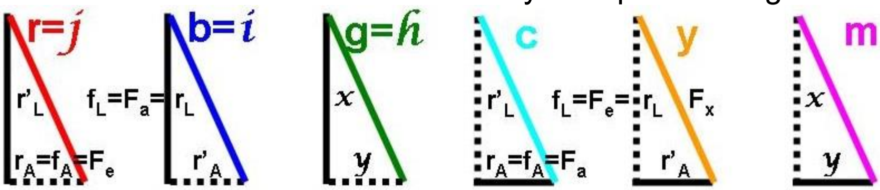
The rectilinear form is still in temporal phase. Unless you are applying a brane to a surface as temporal tension (Quantum Gravity type 1=QG1), you want the out of phase form. Out of phase is the circular radius, which is double the volume radius (2r).

To make G real, we have to rotate it to a right angle relative to the angular and spin axes. Rotation converts from rectangular edge center to vertice (e.g. $z=x+\iota y$) at sec $\pi/4 = \sqrt{2}$. The modifier includes both rotation and radial conversion.

Quantization happens in different types of confining conditions. By confining we mean it cannot escape and ends up being focused and modulated into a material identity. The most common example is the creation of photons by electrons, or x-rays by protons. Weyl fermions, aka semi-metals are an example of this kind of ad hoc instantiation in a conventional alloy.[12]

This is **instantiation**—basically declaring matter where the energy conditions are focused and sharing a common information pattern. Sharing the common pattern is important and connects us to our next body of concepts: oscillation, macrostates, and microstates. Before we jump to that, we need to first recognize a quirk of mater and the universe.

The universe uses things it doesn't have. It also conserves them in such a way we can reasonably argue they are real. Annoying quantum existentialism aside, each quantum identity (color) has two fields: one taking the radiant value and the other absorption value. These triangulate into a common force value as if the universe wasn't already deceptive enough.



F_e=EMR; F_a=EMA; f_L=linear; f_A=angular

[12] Kuroda, K. et al. (Aug. 21, 2017). Evidence for magnetic Weyl fermions in a correlated metal. https://www.nature.com/articles/nmat4987.

These identities are created simultaneously in chiral pairs or at least opposite orientations. This is done by accumulating scalar value in an available pair of related but opposite bands. Band nature determines whether the offspring will eject independently (with no effect on momentum as the ejection has no momentum), or split the host into two new particles.

Only a single unit of radiant value needs to accumulate in this process. That unit and its force identity is the ground state value relative to the change function (the triangulated value). When the unit splits into its opposite halves, the absorption value is applied by the parent/host like space being added when opening a zipper.

One way or another, the result is at least two particles defined in whole or in part by entanglements. Each of these relationships is defined by the information specifying exactly how much value to apply to which field at which point in the sequence those fields are declared.

Each change function, whether it is defining a part or interaction, constitutes a container reacting to this information in sequence. To be clear, if the parts themselves divide into other parts and interactions, they get their dose distinctly and therefore can be ignored on the higher level. The containers themselves are thus called macrostates within which micro changes in energy apply called microstates.[13]

When energy is added into this quagmire of interactions, the transient and native information are subject to normalizing (equilibrium 2nd Law of Thermodynamics[14]). The conflicting instructions result in oscillation that risks identity changes like neutrino flavor change. On a productive note, energy acting on the system changes momentum.

Even though microstates, macrostates, and oscillation were not designed for these quantum purposes, their concepts generally apply. Before we review, let us identify the key differences.

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[13] McGovern, J. (2004). Microstates and Macrostates. University of Manchester. https://theory.physics.manchester.ac.uk/~judith/stat_therm/node55.html.

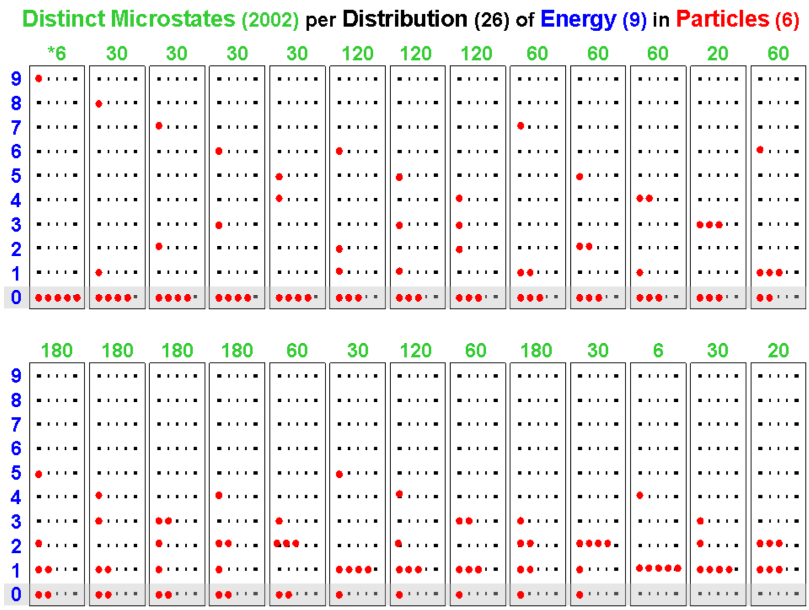
[14] Redner, S. (2006). Equilibrium and the Second Law of Thermodynamics. http://physics.bu.edu/~redner/211-sp06/class-macro-micro/2nd-law.html.

- QR macrostates are contextually proportional and specified by change containers (as opposed to arbitrary and equal).
- At least half the macrostates must have value in any microstate (as opposed to any one can contain all value).
- The lowest maximum value for a macrostate is 2 (maximum 6).

Bose-Einstein

Boltzmann and Gibbs used an accessible density probability on the macrostates variable ρ ln ρ to conceptualize S=k ln W. Shannon ($\sum p$□ $\log_2$ p□) used a binary information approach.[15] Bose and Einstein took a simpler unit approach.

$$\omega(E_x,N)=(E_x+N-1)!/E_x!(N-1)!$$



The Bose-Einstein microstate divides integer units of energy (E_x) among N equal but distinguishable particles. It assumes all the energy of the system can be contained by any single part, or distributed among them severally. Consider 6 distinct particles (N) with 9 units of energy (E_x). To compute microstates:

[15] Bain, J. (2014). Boltzmann Entropy, Gibbs, Entropy, Shannon Information. http://faculty.poly.edu/~jbain/physinfocomp/lectures/03.BoltzGibbsShannon.pdf.

$$\omega=(9+6-1)!/9!(6-1)!=14!/9!5!$$
$$= 14\times13\times\underline{12}\times\underline{10}/\underline{5}\times\underline{4}\times\underline{3}\times\underline{2}\times1 = 14\times13 = 2002$$

To show this distribution, simplify the microstates into macrostates. Each macrostate represents an indistinguishable distribution of energy units across the parts. In the diagram, each dot represents one of six material identities. These are "loose" identities, meaning their interaction is not relevant.

Where the dot is placed vertically describes the amount of energy units applied to that indistinguishable part. Each box represents a macrostate—a traditionally arbitrary region. Within a macrostate of the table above, the sum total of energy in the system is always $E_x=9$.[16]

In the diagram, at the bottom of the box are all the identities without value. These are highlighted to draw attention to them. If we label each of these dots to make them distinct, we may label them parts A,B,C,D,E,F respectively. At the top of each box is a number indicating the number of possible ways to label the energy values provided.

All those with zero value aren't counted as ordered. Only those with value can be ordered. If all the energy is in one identity container, that container could be any one of the six identified, so there are six possible microstates for a macrostate (Ω) distributing all the energy to one. There are 30 ways we can arrange the containers when only two have energy, and so on.

$$\omega/\Omega=N!/N_o!N_a!$$

N is the number of possible containers. N_o is the number of containers whose value is 0 (noting 0!=1). N_a is the number of containers with energy.

Adaptations

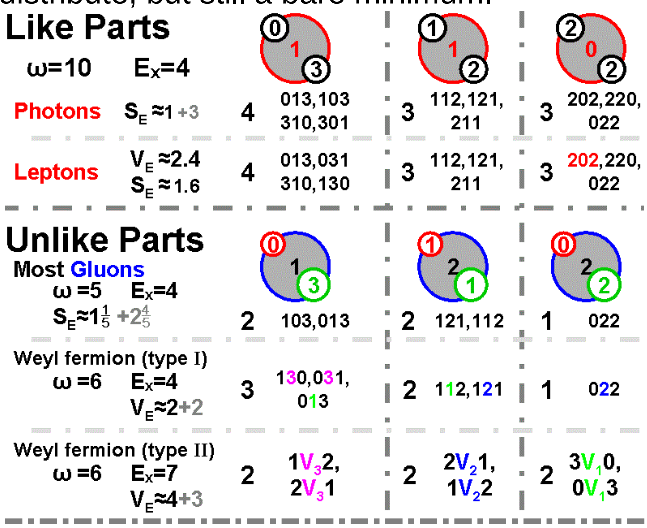
QR analysis of microstates is about the use of space to interact, evolve, and move. For microstates to reflect matter in this process and the use of space, the distribution needs to reflect proportional values and maintain enough distribution for

[16] Nave, C.R. (2017). The distribution of 9 units of energy among 6 identical particles (et seq). hyperphysics.phy-astr.gsu.edu/hbase/quantum/disbol.html#c1. Hock, K.M. (2014). Basic Statistical Mechanics. University of Liverpool. http://hep.ph.liv.ac.uk/~hock/Teaching/2013-2014/1-basics.pdf.

identity. We assume at least half the parts and interactions will always have some value and up to half can have no value.

$$S = -\underbrace{\left(\underbrace{k_B}_{\text{unit conversion}} \ln \underbrace{\omega}_{\text{microstates}}\right)}_{\text{APPLIED RATE}} \underbrace{\left(\rho_B = \sum_i \underbrace{\left(\frac{\overbrace{E_{xi}}^{\text{units applied}}}{\underbrace{E_x k_i}_{\text{total units}}}\right)}_{\text{specific change}} \underbrace{\left(\frac{\overbrace{\omega_N}^{\text{instances}}}{\underbrace{\omega}_{\text{microstates}}}\right)}_{\text{container weight}}\right)}_{\text{ENERGY DENSITY}}$$

How the parts apply those values when they have them is proportional to them specifically. For example, the ratio of ν:μ is 1:*e*. Since we are working in whole increments we round up to 1:3. We double this to be sure we have something to actually distribute, but still a bare minimum.

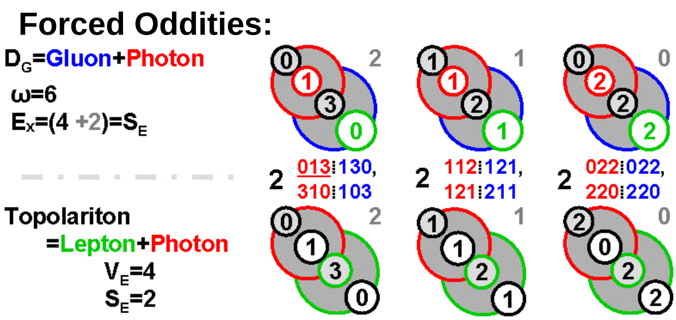


We always reduce to the bare minimum too. This means an identical or even chiral pair of anything like a photon can have a distributions looking like 2,0,2, 2,1,1, 2,2,0, 3,1,0 etc. but not 4,0,0. Of course this means we really need to know the "structures" we are working with (next chapter). Structure better fits Bose and Einstein's relativistic particles than the quantum particles they are constructed from.

Analyzing microstates like this shows why particles move around as they do (see below). There is of course more to the analysis than this. Photons have the ideal ground state speed of c because they are just interacting with their reflections.

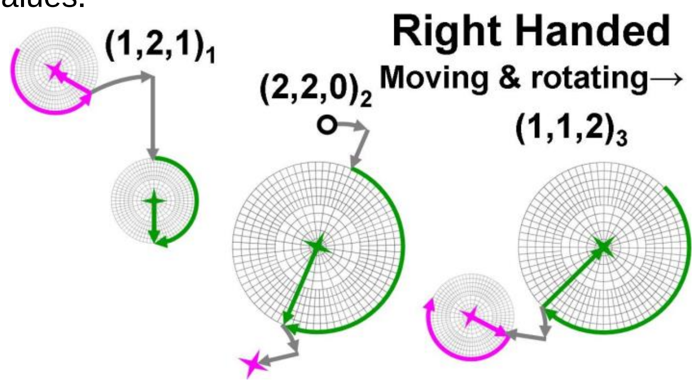
They don’t need momentum. If you add momentum, they suddenly have mass and slow down rapidly.

Oddities like singlets and weak bosons become incredibly messy. The three photon singlet (rc+by-gm)/√3 requires a unit in each rc, by, gm, up to 2 in rc and by, and up to 3 in gm. The distribution among primordials and bands comes to 558 microstates for E=5 following those rules.



[17]

Neutrinos consist of chiral halves and isospin (antineutrino –½ reverses microstates causing annihilation with a +½ neutrino). This is exactly opposite to photon perfect. They have no intrinsic motion because their chiral halves undo each other. They just oscillate in place. Other leptons have intrinsic momentum, which is problematic for identifying their ground state values.



The diagram above neglects the 3,1,0 position, but gives you an idea. It is right handed because the way space is defined is going the same direction as the trajectory of intrinsic motion. As energy is moving around, it is adding value to the

[17] For more on topolaritons: Refael, G. et al. (Jul. 1, 2015). Topological Polaritons. CalTech. https://journals.aps.org/prx/abstract/10.1103/PhysRevX.5.031001.

parts and interactions either together (ι=AND or ɦ=BOTH) or sequentially (ȷ=OR) as locally defined.

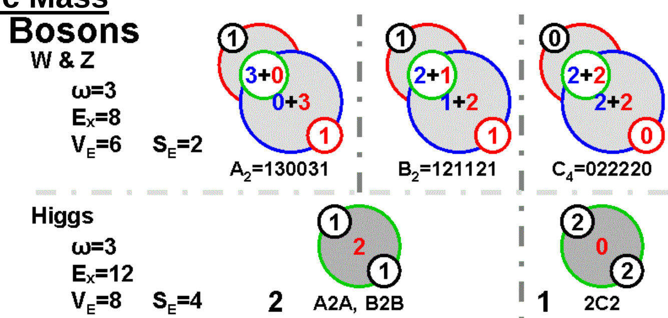
This is a highly straight-forward system of simply increasing line and arc lengths per change function specifications. The energy is literally just moving around in a fixed pattern. The totality of that pattern sequence is a cycle, which only happens ONCE and then the universe happens to it until it is violated.

The cycle details are the individual. They are semi-independent of time in that the light is still being conveyed at the speed of light through all these microstates. As you add energy to the system, the resistance to completing microstates diminishes as time differentiates into entropies. This causes the frequency (cycle rate) to increase despite increase in band length and dilation.

The added energy comes with its own oscillating sense of direction. It can ONLY accumulate in these available spaces. The fewer available spaces, the harder it is to move something. Being difficult to hit the target is not the same as the resistance of the target to change (penetration, e.g. mass).

When energy accumulates in these spaces, its sense of direction affects the trajectory of the microstate motion. For a neutrino that original direction is nowhere. Real easy to move: just add energy. The argumentative effect on microstates is appropriately called oscillation. Oscillation energy levels can cause identity change via proportions or new matter formation, as with an electron creating a photon.

Intrinsic Mass



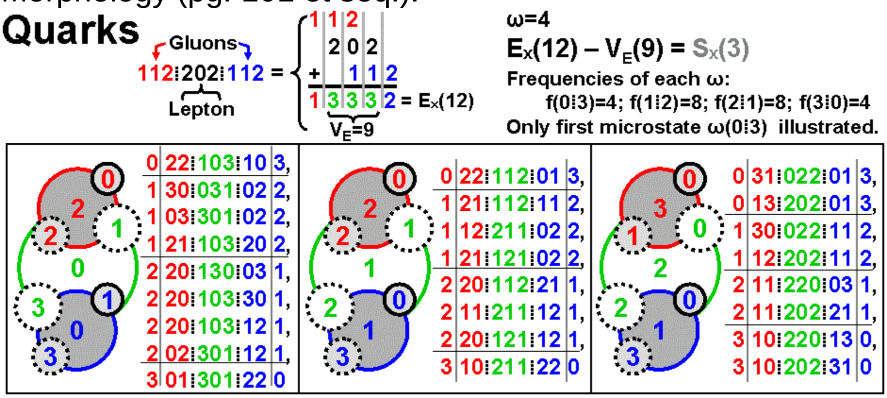
These microstate conditions are incredibly ambiguous as we will see with particle morphology (see pg. 110 et seq.). It is highly likely the microstate breakdowns here for singlets, weak bosons, quarks, and baryons are incomplete and hypothetical.

Just as important as motion is the geodesic field equation (GFE) giving ground state mass. Relation to Newton and mass via Poisson is provided on pg. 17. The GFE requires volume and surface interaction. Values must simultaneously define those spaces.

Microstates make this unreliable for charged leptons causing a statistical reduction of mass. The unreliable distribution robs them of most of their mass potential. Weak bosons simply alternate which half of their parts is acting as surface versus volume at any given time.

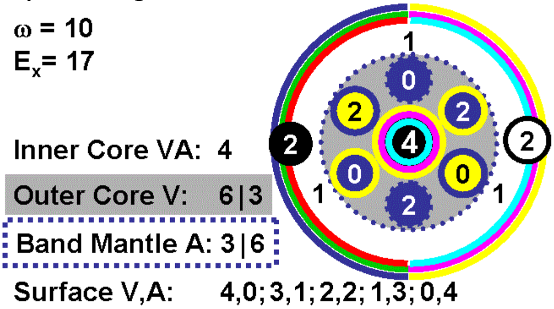
These and later diagrams are not to be taken as literal constructs. The parts are interacting to create spaces. We are simply trying to illustrate which parts are doing what when. The W & Z bosons shown here are partially covering up their other parts. The Higgs boson is easier because it is simply two chiral type II Weyl fermions in transition most probably to tau neutrino or related. “Structures” are covered under Quantum Morphology (pg. 101 et seq.).

Quarks



Quarks are significantly involved because they consist of a lepton plus two gluons. This makes them highly volatile and unstable. When they form a baryon such as pion, kauon, nucleon, etc., they actually “bond” on several levels. The easiest way to visualize them is in layers.

The gluons normalize into commensurate leptons. The arrangement of these leptons is even more interesting. A nucleon as below is held together by two tau neutrino leptons acting as both nucleating core and surface. It is as if the core is a Higgs except for significant and confined role changes.



Misapplication of the Higgs boson draws us to outline the elements of classical mass we are systematically solving:

1. Volume and surface interaction satisfies geodesic field equation.
2. Reduce proportional to the microstate frequency the GFE condition is simultaneously satisfied.
3. Excess energy in bands becomes momentum adding mass to any identity via Relativistic momentum: $E^2=(mc^2)^2+(pc)^2$.
4. Changes in band rotation affects the ability to satisfy GFE, including taking away mass or adding mass.
5. Dilation and oscillation apply as bands approach their unit capacity.

Constructing Spacetime

To see how microstates, momentum, and mass work, we first need to understand how the use of space evolves to give us workable fields. Relativistic spacetime emerges when the GFE apply in a complex multi-stage developmental process.

1. Extra-temporal color charge surfaces are valued.
2. Temporal phase impositions are applied to define fields with potential to strongly interact.
3. This is confined in a quasi-temporal interaction such as
   - bond creating a subspace volume
   - entanglement creating a subspace surface
   - transient (weak) interaction creating both surface and volume satisfying GFE.
4. Transition resolves, volumes and surfaces confining together into a common attributed entanglement surface conditionally satisfying the GFE.

Background

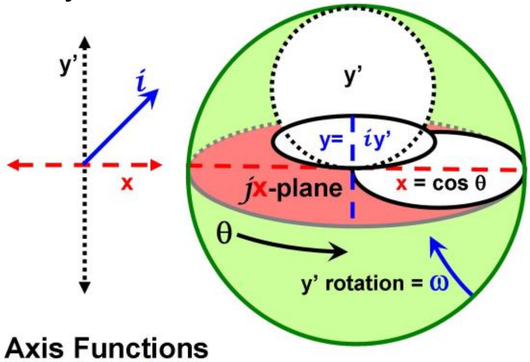
Euler's z=x+ιy interprets in a variety of ways depending the context you put it in. His famous interpretation was of a helix due to application in rectangular (Euclidean/Cartesian) coordinates (see pg. 62). Euler's helix works for evolving 2-3-4 dimensions due to the conversion conventions sin u=y and cos u=x that enable making this a circular problem.[1]

There is only one small problem with the way these variables are discussed. The y axis is imaginary due to the definition of sine. This of course applies to a 2-D coordinate system, which is ideational and therefore virtual/imaginary anyway. For this reason, we use y' for the y axis in a 2-D system below.

By multiplying ιy', the imaginary element is stripped from the denominator of Euler's definition making it quasi-real. The only thing left imaginary in Euler's functions thereafter is the

[1] Brown, J.W. & Churchill, R.V. (2009). Complex Variables and Applications. 7 ed. McGraw Hill. math.unice.fr/~nivoche/pdf/Brown-Churchill-Complex%20Variables%20and%20Application%208th%20edition.pdf.

exponential use of ı. Assuming u is a scalar, ıu=ƒ(ȷx)=ƒ(θ) we don't need to worry about, but it provides real results. Sine and cosine in polar coordinates provide circles straddling π/2 and 0 respectively as illustrated.



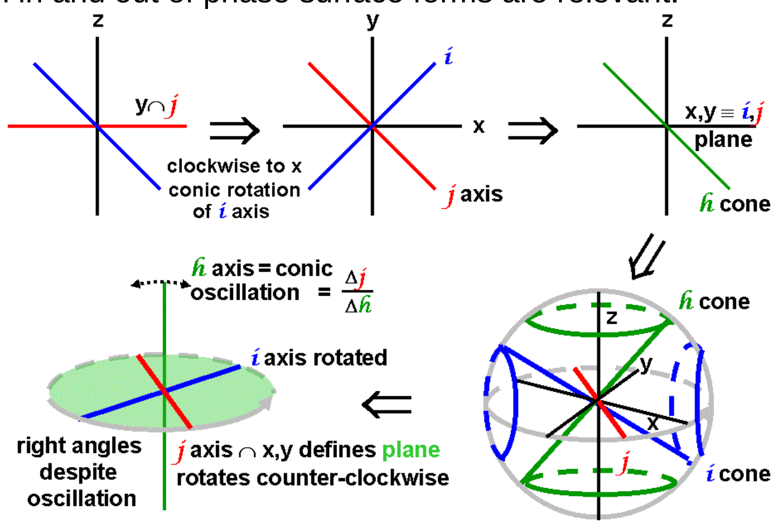
Axis Functions

Linear $i\,(y') + (x) = z$

Circular $i\,(\sin\theta) + (\cos\theta) = \text{cis}\,\theta$

Complex $i\left(\frac{e^{iu}-e^{-iu}}{2i}\right)+\left(\frac{e^{iu}+e^{-iu}}{2}\right) = e^{iu}$

Let us pause and observe three distinct sets of axes: ȷ∩x, ı∩y, and ɦ∩z. Each linear value is coupled with a change function such that an axis never occurs alone. The intersects of these values with their changes define complex surfaces consistent with primordial color identities. Though confined, both in and out of phase surface forms are relevant.



Entanglement bands (aka flux tubes) often act as the confining surface feature and define energy potential. As with weak boson surfaces, if the entanglement confines a volume without negating itself, the GFE are satisfied. Spacetime mechanics will solve the ever elusive (Yang-Mills) mass problem.

Volume derives by proportionally combining these complex variables. At a primordial level, the only way to join ȷ+ı to get ɦ is by stepping down the magnitude of ı to its light form. Otherwise, to ɦ, ȷ and ı are viewed as unit values bound to individually (type I Weyl fermions) or together (type II).

If we follow through with applying our imaginary numbers across the board with the correct variables, we get an imaginary circle pretending to be real.

$$(ɦr=ȷx+ıy)^2 = (-r^2=-x^2-y^2) = (r^2=x^2+y^2)$$

Next, we combine these to form a REAL volume, including a z-axis. Correctly applied, we get a real sphere:

$$(ɦ'r+ɦz=ȷx+ıy)^2 = (r^2-z^2=-x^2-y^2) = (r^2=x^2+y^2+z^2)$$

Spherical ɦ'r is a real point density distribution (divergence) of a generalization (gradient) in time (dt= δȷ + δı, see pg. 18). It derives from a hypercomplex n-Euclidean dimensional function that derives from a complex surface. It satisfies the elements of the Laplacian operator,[2] providing a common frame of reference.

Spin is an awkward concept, but here it conveys the notion of cycle defining a thing. A full unit of spin would describe an ordinary out of phase surface. Here, our Laplacian-satisfying volume also reduces the radial value of spin defining the surface by half. Basically it is saying the space is largely occupied, therefore subject to Pauli exclusion.

Why do we care about the root surfaces out of phase? Surfaces out of phase are relevant to interactions out of phase. Interactions out of phase include light, entanglements and their evolved forms we call Quantized Vector Interactions (QVI). QVI include Quantized Angular Momentum and Loop Quantum Gravity.

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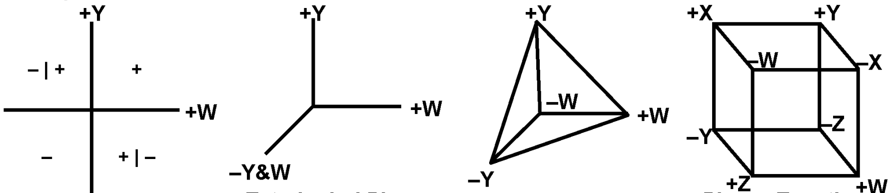
[2] Stewart, J. (2017). Calculus: Concepts and Contexts – Enhanced. 3 ed. Phoenix, AZ: Content Technologies, Inc.

The space between the phase-defined volume and the out of phase surface is an opportunity for a field to act at a distance. This is not to say it quantizes, but it can. Quantizing locks the relationship between the bodies, forming one type of entanglement or another. Every entanglement involves value sharing as fits the relationship. These get increasingly complex as matter evolves.



Flat Plane　Tetrahedral Plane (top view)　Solid Tetrahedron　Planes Together as a Cube

Vital to Lie theory and manifolds (see pg. 93 et seq.) is the Haar measure concept of left-right orientations of a locally compact group as opposed to subtractive – and additive +.[3] Here we take a simple conventional rectangular plane and convert it first to Haar. This means positive and negative of the same axis are at right angles relative to each other.

The general axes are also at right angles to each other. This is called a tetrahedral plane because we can connect all these points into a tetrahedron. We can also use an arc to connect them singularly to show an S-shaped pattern like ι-entropy—e.g. electron orbit pattern.

Putting two planes of two Haar measure axes at right angles to each other connects four spatial dimension axes to the vertices of a cube. As trivial as this seems, we already encountered an instance of this that got folded nicely into a Laplacian. The Laplacian allows us to make an n-dimensional sphere conveniently rectangular and vice-versa.

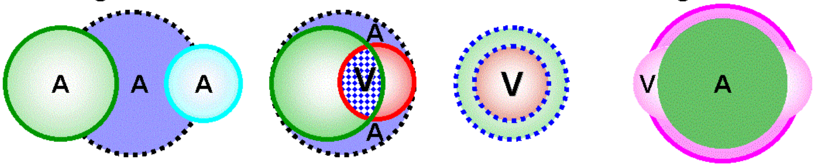
Basic Interactions

We have achieved quasi-temporal spacetime volume derived from surface, and surface derived from extra-temporal surfaces. By quasi-temporal we mean the temporal shape is there, but the extra-temporal surfaces are still relevant to interactions in the phase "moment."

[3] Abbaspour, H. & Moskowitz, M.A. (2007). Basic Lie Theory. World Scientific.

Interactions evolve with matter, so it is important to specify the level of application. Primordial interactions include: bond, entangle, and transient. Bonds allow change functions to merge into a common self-defining volume and energy value.

Without a bond, a primordial is a surface conditionally subject to phase condition applying it to volume without defining a volume. Primordial "bonding" is required to satisfy volume. "Bonding" includes bound and the act or appearance of forming a bond due to transient interactions.



Transient interactions are not bound or entangled but either establishing bonds and entanglements or simply incidental to passing through all or part of the same location. The bond does not need to actually exist to be in a bond-like position and create volume.

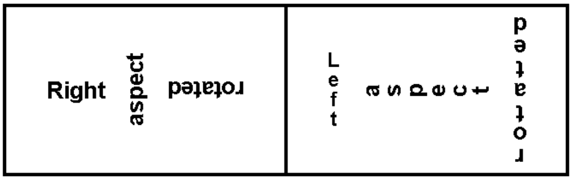
The transient interaction is consistent with weak boson characteristics, like extreme mass. The transient interaction enjoys a complex set of microstates allowing volume and surface to coexist from the same set of values without actually having an entanglement or bond.

Unlike bonds and entanglements, the transient interaction does not require energy reduction because all the parts are still individuals. Unlike bonds, the transient volume is extra-temporal allowing for a sort of quantum tunneling effect of the Heisenberg uncertainty principle.[4]

Since the universe prefers the least restrictive path, to narrow the uncertainty, control the potential for a particular outcome. The mechanism for this is built into the extratemporal characteristics of matter like microstate cycles, and out of phase brane definitions. The universe cheats where it can to utilize these. In the case of quantum tunneling, it passes through a barrier it normally couldn't.

[4] Mastin, L. (2009). Quantum Tunneling and the Uncertainty Principle. http://www.physicsoftheuniverse.com/topics_quantum_uncertainty.html.

A fixed volume reduces the radius used to define the surface by half. In this case, parts of the volume and surface are swapping places in microstates. The surface does not exclude, so the surfaces permit passage. Consequently, weak bosons are given a unit of spin, which accounts for their surfaces. Their incredible masses result from the confined volume of transient interaction.

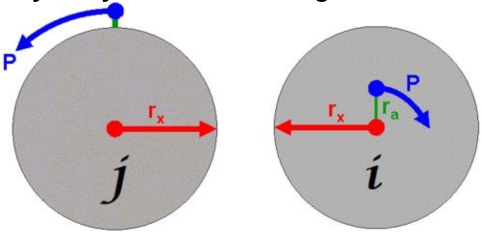


This cheating includes rotating position. As the diagram illustrates, aspect is the universe's way of saying which end is up. The forms are already chiral, which helps. Light cannot tell which end is what when it encounters a surface out of phase. It gets bent by the conversion of the space into phase, but otherwise ignores the surface.

Brane Surgery

QR branes are not to be confused with String branes. In QR a brane is a surface without depth—the derivative of a volume or surface with depth (membrane). The space of a lepton is best described as a membrane because it has depth. Photons and gluons, however, consist exclusively of branes.

Branes are evaluated both in and out of phase due to acting and potentially interacting both ways simultaneously. The sequential difference in the branes of blue (ı) and red (ȷ) colors shows why they are left and right handed.



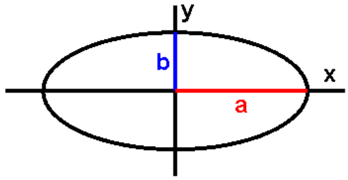
These are not, however, accurate representations of a brane surface being converted. The change function divides it into separate linear and angular values handled differently. For ȷ, the rotating radius is stacked onto the linear. For ı, both are measured from the geometric origin. The brane out of phase is ellipse-like (smoothing computations) rather than a simple circle.

$$1 = \frac{x^2}{a^2} + \frac{y^2}{b^2}$$

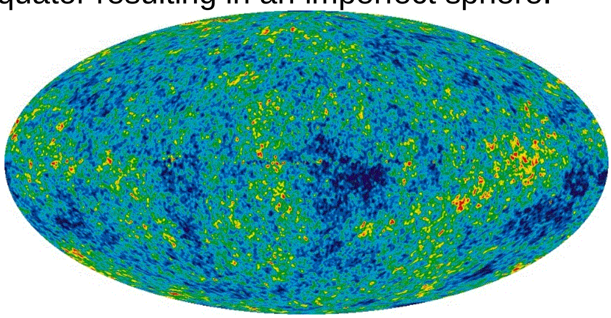
$$a^2b^2 = b^2x^2 + a^2y^2$$

$$a^2b^2 = b^2\cos^2 u + a^2\sin^2 u$$

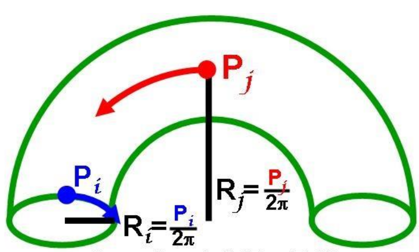
$$y = \sqrt{b^2 - \frac{b^2x^2}{a^2}} = b + \jmath\,\frac{bx}{a}$$



The difference makes them as easy to handle as applying a projection like the WMAP (121238) image below to the surface of a sphere by wrapping it around the equator. A singularity is extremely convenient to exactly this evaluation method. The wrap into phase distinguishes linear poles from angular equator resulting in an imperfect sphere.



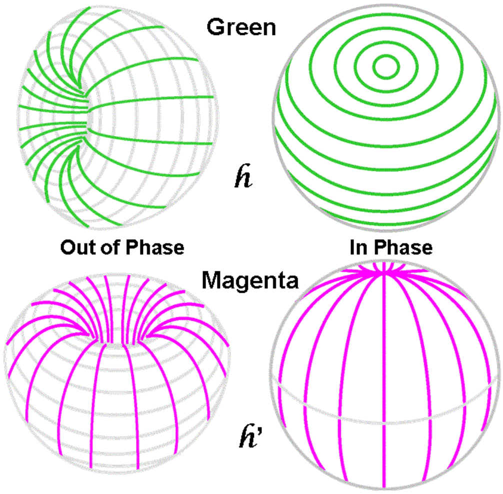
Phase entropies (ɦ and ɦ') are also extra-temporal and subject to being put into temporal phase (ƙ□). Their branes are a tad more abstract in their construction. So far we have only dealt with linear and angular divisions of ı and ȷ. Put together we have linear on linear defining angular on angular. Thanks to ȷ they are stacked, and thanks to ı they are concurrent.



Area $A = 4\pi^2 (R_j + \jmath R_i)^2$

Spherical Radius $r^2 = A/4\pi$

The values going into the toroid are angular. You have to backtrack from angular to linear radii to find the toroid's surface area. You can then derive the spherical radius that surface applies to.[5] Magenta already corresponds to longitudes. Rotation of green into temporal phase provides latitudes as shown.



There is an extra layer of ambiguity in the out of phase mode relevant on two levels: strong interactions and magnetism. Strong interactions fill available space, like ι into ȷ. This is a reason green/magenta are always part of a strong primordial bond. The energy proportions are why the bonds must be simultaneous.

A magnetic field looks like out of phase magenta (ħ'). This is misleading as it is both, but we like orienting it this way. It is toroid expanding latitudes by intrinsic ordered ȷ and diverging longitudes by disordered ι. Their common function is in units of angular pressure (A/m=2×10^{-7}kg/m s^2=$\acute{\varepsilon}_a/2$).

In a magnetic field, B is **flux density**—the intrinsic energy value= f(ȷ). Its units are kg/As^2, with 1A (amp)=2×10^{-7} kg/s^2.[6] B/μ_0 makes it an angular pressure unit ($\acute{\varepsilon}_a$) compatible with H=A/m. H is the **field strength**, better described as angular flux= f(ι). B/H=μ□ is material-specific permeability[7]—how energy is giving value to a space.

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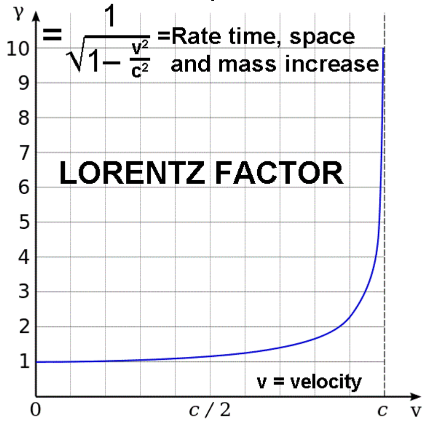
[5] Ness, R. (2015). Surface and Volume Equations. nessengr.com/technical-data/surface-and-volume-equations/

[6] SI Brochure: The International System of Units (SI) [8th edition, 2006; updated in 2014]. https://www.bipm.org/en/publications/si-brochure/ampere.html.

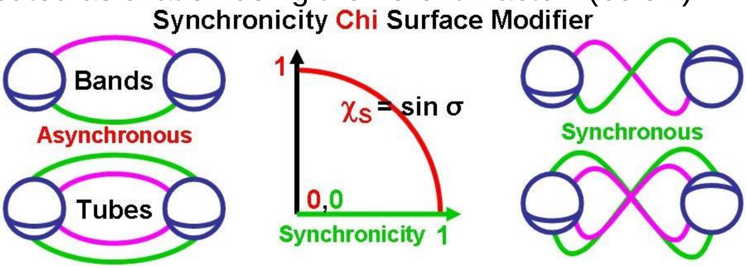
[7] Nave, C.R. (2017). Magnetic Field Strength H. Georgia State University. http://hyperphysics.phy-astr.gsu.edu/hbase/magnetic/magfield.html.

Inactive Surfaces

An entanglement space is given value by the absorption values of the parts at ground state. This space increases as the energy of momentum is added causing the space to stretch like a rubber band. When that energy is released, the “band” snaps back to its ground state value. The ground state value is necessary just for conveying intrinsic energy of identity through the microstate process defining a cycle.



The energy of momentum (p) cannot exceed the available absorption value of the parts, despite the lack of apparent boundary conditions in $E^2=(mc^2)^2+(pc)^2$. As that energy accumulates, the microstates defining the intrinsic state of motion increase their frequency. That increase causes acceleration resisted by the inability to add more energy computed as dilation using the Lorentz factor[8] (below).



Bands always occur in chiral pairs of one change function—like ι and ι’ in an electron. Bands are always of primordial magnitude. More advanced matter like the

[8] Forshaw, J. & Smith, G. (2014). Dynamics and Relativity. Hoboken, NJ: John Wiley & Sons.

entangled volumes of quarks and leptons simply compound a pair of bands into each flux tube. Flux tubes thus have two surfaces in phase making them membrane-like with depth.

To be in temporal phase and act as a surface, the bands must be asynchronous—not cross over each other. This occurs with gluons and charged leptons. Crossing over only cancels the ability to function temporally (a synchronous chi=χ□ function). It does not cancel the entanglement.

Photons are colors entangled with their mirror image, where neutrinos are entangled chiral pairs. Either way, the parts are in opposite aspect positions causing the bands to synchronize. Adding energy or filtering to change relative rotation causes them to unwind and acquire relativistic qualities like dilation, slowing them from their ideal c-speed.[9]

Accelerating a neutrino adds mass to resist and triggers oscillation that can change flavor (Weyl fermion identity).[10] This was falsely attributed to ground state mass as quoted in the Nobel press release:

> The discovery led to the far-reaching conclusion that neutrinos, which for a long time were considered massless, must have some mass, however small.

A reach too far. Mass as a function of particle definition consists of parallel concepts of momentum and satisfying the GFE. To have mass at ground state, the GFE surface-volume interaction must be satisfied. Synchronous bands neutralize the surfaces making ground state mass impossible for neutrinos. The Nobel Prize was given to

> Takaaki Kajita in Japan and Arthur B. McDonald in Canada, for their key contributions to the experiments which demonstrated that neutrinos change identities. This metamorphosis requires that neutrinos have mass.

That does not require neutrinos have ground state mass, only that they have mass to oscillate into another flavor.

[9] Giovannini, D. et al. (Feb. 20, 2015). Spatially structured photons that travel in free space slower than the speed of light. Science. Vol. 347, Issue 6224, pp. 857-860. http://science.sciencemag.org/content/347/6224/857.
[10] The Royal Swedish Academiy of Sciences. (Oct. 6, 2015). Press Release. https://www.nobelprize.org/nobel_prizes/physics/laureates/2015/press.html.

Tensor Manifolds

From a quantum perspective, absolutely nothing can be taken for granted. Just because you have an area does not mean it is shaped this way or that or has a perimeter. Likewise, stating a volume does not equate to a geometry or surface. Each of these things is distinct. A distinct thing can be quantized—made a full quantum number with profound impact on the rest of the set.

A tensor is transformational scalar, vector, or group;[11] a geometric object of n^{th}-rank (directions) generalizing scalar (n=0), vector (n=1), and matrix (array/atlas; n=2) transformations.[12] A manifold is a topologically Euclidean space—meaning it can differentiate as flat like Earth being round versus our perspective of a flat surface.[13] A tensor manifold here is a fundamental subspace construct describing a differentiable and interactively shaping field space.

Term Declarations

As stated in the introduction, to solve evolved problems we need to use evolved thinking, language, and concepts. We are here in this discussion due to a haunting mathematical experiment in 1991. The experiment sought a relationship between Euler's geometries, Relativity, and basic mathematical concepts like line, angle, scalar, etc.

The experiment found what has come to be called the Periodic Matrix or simply the Matrix. It was little more than a toy until several years later the same phenomenon was found with established elements in the social sciences. It has since evolved many times as its applications and terms were explored. To be safe, we mostly use it to organize variables.

By established we don't mean it was just the theory of the day. It appeared in epistemology and developmental psychology concepts spanning recorded history. Geography and history were of no consequence. The same exact

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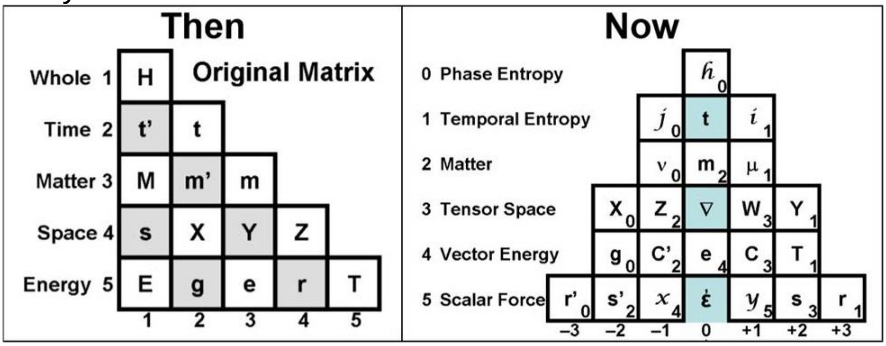
[11] Kolecki, J.C. (2002). An Introduction to Tensors for Students of Physics and Engineering. Cleveland, OH: Glenn Research Center. grc.nasa.gov/www/k-12/Numbers/Math/documents/Tensors_TM2002211716.pdf.

[12] Rowland, T. & Weisstein, E.W. (2018). Tensor. From MathWorld--A Wolfram Web Resource. http://mathworld.wolfram.com/Tensor.html.

[13] Rowland, T. (2018). Manifold. From MathWorld--A Wolfram Web Resource, created by Eric W. Weisstein. http://mathworld.wolfram.com/Manifold.html.

concepts emerged in exactly the same patterns independently everywhere.[14]



We do not wish to dwell too much on the Matrix since it has not established itself in physics. We honestly don't fully understand how its interpretations work either. We generally let the physics take care of itself and note how the Matrix is exhibiting the same thing.

The initial relationship defining the Matrix simply followed Relativity using row and column values as exponential functions. In this way we can see the vector of gravity (g) derives from putting linear force r' in $\jmath$-change: $g=r'/\jmath$.

These are PDE variables, meaning they are unknown change functions.[15] They are very tricky and easy to misinterpret. Context changes which interpretation to apply. A seemingly straight-forward $\imath\jmath \equiv t^2$ also evaluates as $\imath^2+\jmath^2=2ɦ^2$ with both Pythagorean and quadratic paths not to mention differential $\delta\imath+\delta\jmath=dt$ and the related extra-temporal phase interpretations.

It turns out that one set of evaluations actually provides the Lie groups needed to construct and evaluate subspace manifolds, their interactions and evolution. We cannot presume, however, that each evolution should be broken down the same way. One great reason for caution is the mathematical expectation of smoothness, which evaporates quickly through the evolutions of matter.

Despite our handicaps, we find the processes and variables of the Matrix useful. To put meat on our madness,

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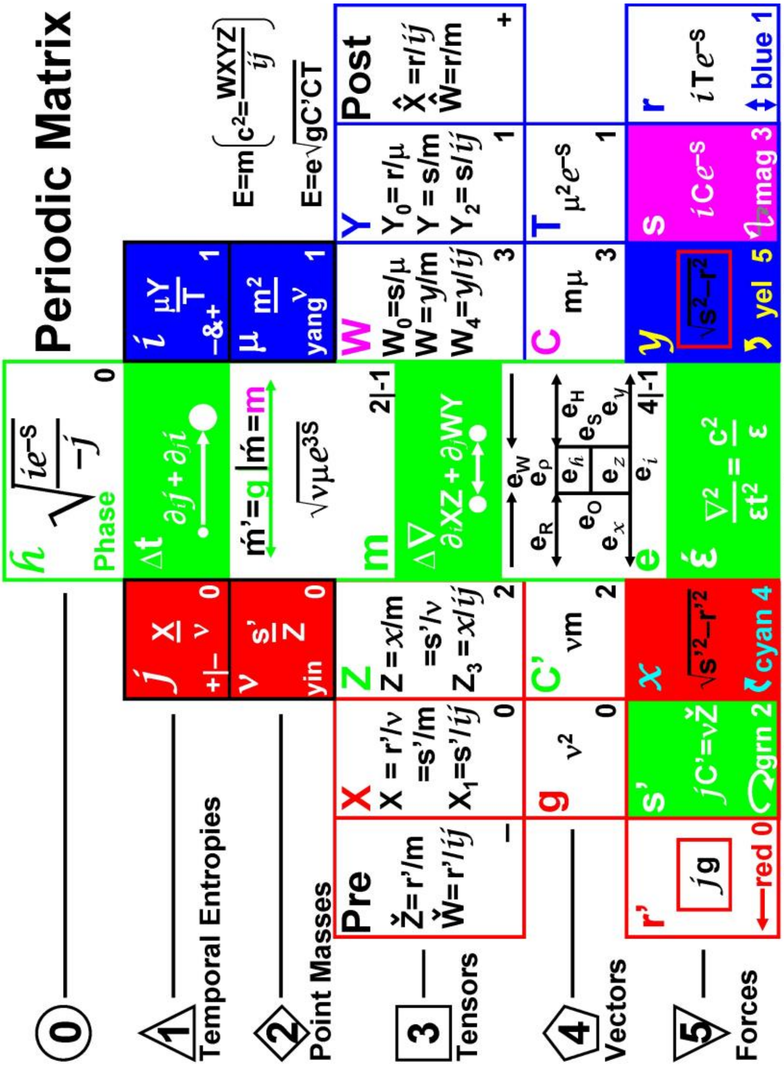
[14] PŭMa Tse. (2015). Love and Consciousness. Akademé.

[15] Grigoryan, V. (2010). Partial Differential Equations. UC Santa Barbara. web.math. ucsb.edu/~grigoryan/124A.pdf.

we observe manifolds on the Matrix cross over from one level of development into another. These are shown to the right and left as sub-Z|W (crowned as Ž) and super-X|W (capped as Ŵ).

Periodic Matrix



Special note: We use the Matrix to keep track of all the variables and sub-variables. When we use or create another graphic, we edit relative to the Matrix. The Matrix is our most current and accurate. This is not always as easy to read as we would like. We are still working to solidify ι (imaginary) is blue and ι' (quasi-real i-prime) is yellow.

Sub/pre-applications are intrinsic buildups from a lesser level. At a fundamental level this would be a scalar (tensor of n=0). Super/post-applications are contributions to a greater level—another scalar. Interactions of these sub and super applications would result in mutual vector interaction (n=1).

Intrinsic spaces build into a complex atlas (array/matrix) of bi and n-directional interactive geometries. Analyzing one force at a time as a Lie group enables us to construct these spaces and then apply them as interactive functions.

Before we step away from the Matrix as source we need to make a couple observations. First, the top and bottom of the Matrix are fundamental. Everything else derives from their constructs starting with defining tensor manifolds.

For simplicity, the force value is already put into kg m units for each function. First thing we notice is that a significant number of these subspaces depend on emergent material values. These values do not occur without interaction we would consider confining into a greater identity. This leaves range and domain values unspecified—unsustainably virtual.

j-Tensors | h_j h'_i | **i-Tensors**

$f(r'|s'|x)=[V_f,\pm(m_f-\nu_f)]$ $f(r|s|y)=[\pm(V_f\pm\mu_f),m_f]$

$\check{Z} = \frac{r'_M}{m}$ **Void Range** $\frac{r_M}{m} = \hat{W}$

$\check{W} = \frac{r'_M}{ij} = V_{+L}$ **Brane Vector** $V_{-L} = \frac{r_M}{ij} = \hat{X}_0$

$X = \frac{r'_M}{\nu} = \frac{s'_M}{m} = X$ **Brane Range*** $Y = \frac{s_M}{m}$; $\frac{r_M}{\mu} = Y_0$

$X_1 = \frac{s'_M}{ij} = V_{js}$ **Spin Vector** $V_{is} = \frac{s_M}{ij} = Y_2$

$\frac{s'_M}{\nu} = Z = \frac{x_M}{m}$ **Volume Domain*** $\frac{y_M}{m} = W$ $\frac{s_M}{\mu} = W_0$

$f_M = \frac{cf_U}{\varepsilon_S} \Rightarrow$ kg m $Z_3 = \frac{x_M}{ij} = {}_{-A}V_{+A} = \frac{y_M}{ij} = W_4$ **Vector**

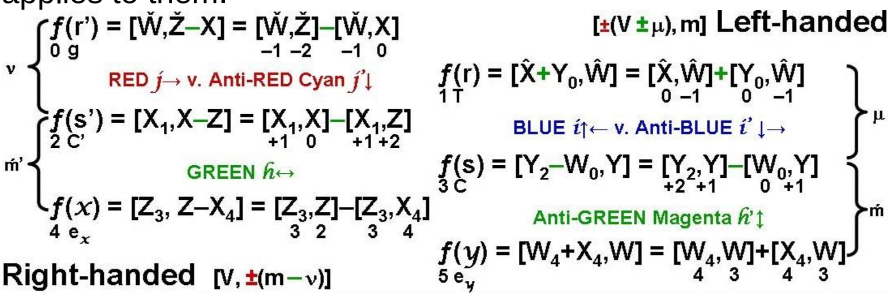
Equatorial Range $\frac{x_M}{\nu} \overset{B}{=} \hat{X}_4 \overset{H}{=} \frac{y_M}{\mu}$ **Polar Domain**

***independent: Y_0= brane domain W_0=range**

Lie Groups

A Lie group is a differentiable manifold with smooth group operations, providing a continuous symmetry.[16] Our groups are defined first by a change condition into which EMA and EMR force values apply.

Change application specifies the force values into linear r'|r, angular x|y, and spin s'|s. The specifics give us basic groups of subspaces manifesting into existence as value applies to them.



These breakdowns use the bilinear mapping of Lie algebra (as below) to distinguish specific interactions. In [u,v], u is the change tensor being applied to otherwise static v.

$$[A,B+C] = \mathcal{L}_A B + \mathcal{L}_A C = [A,B] + [A,C]$$

$$[A,B-C] = \mathcal{L}_A B + (\mathcal{L}_A C)^{-1} \qquad C = F/(\nu|\mu)$$

$$= [A,B] - [A,C] = [A,B] + [C,A]$$

Both left and right use the vector as at least part of the change tensor. Right-handed resists change by compounding its static values (m and ν). Left-handed compounds change with disorder (μ). The function resolves by tabling u|v(F) on pg. 96 for the Lie derivative definition: f(F)=[u,v]→[u,v](F)=

$$\mathcal{L}_u\, v(F) = \partial_u\, v(F) - \partial_v\, u(F)$$

where:

$$\partial_u\, v(F) = \lim_{t\to\infty} \frac{v(F+tu(F)) - v(F)}{t}$$

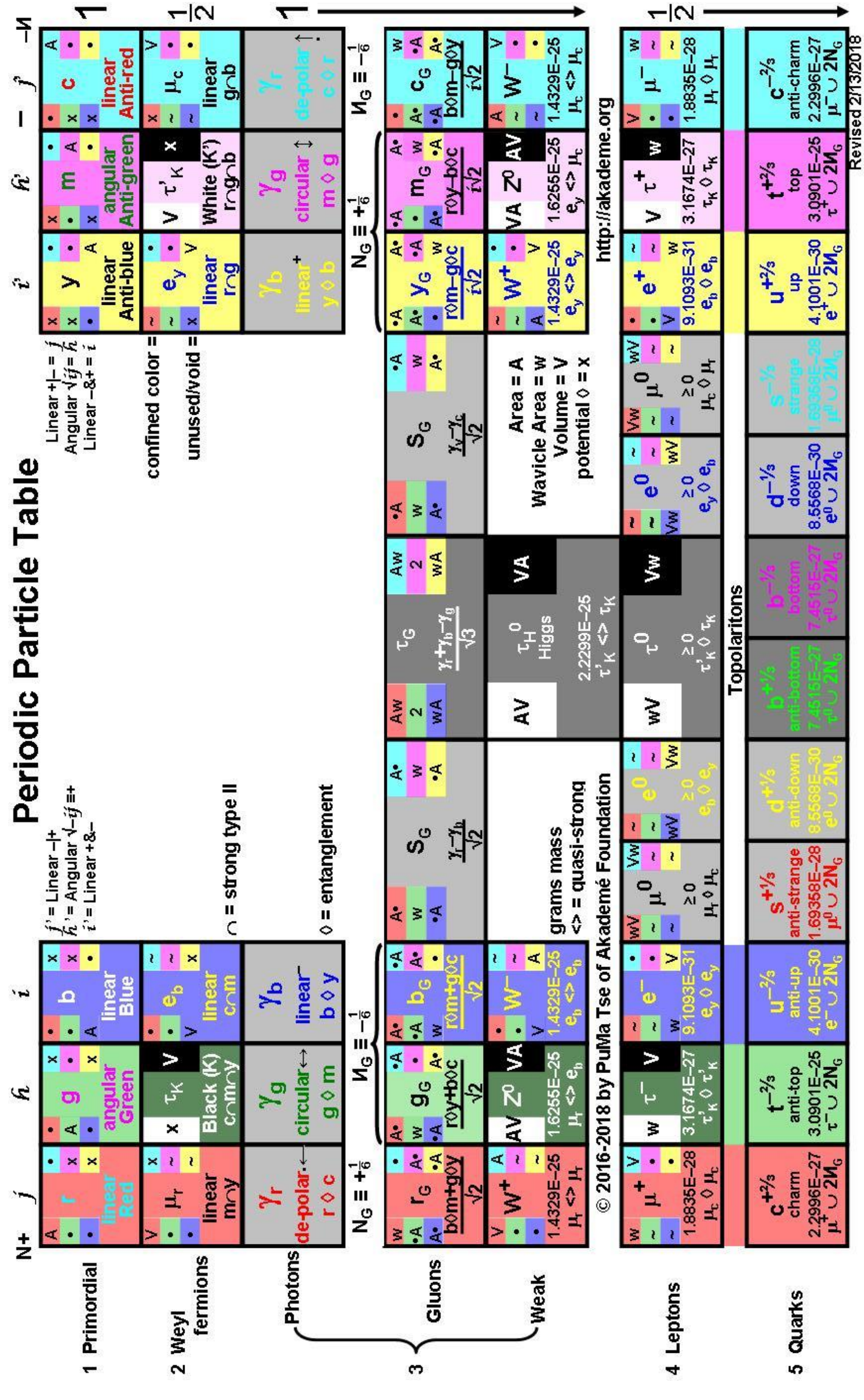
[16] Warner, F.W. (1984). Foundations of Differentiable Manifolds and Lie Groups. Glenview, IL: Scott-Foresman and Company. wisdom.weizmann.ac.il/~dnovikov/Manifolds5775/Warner_Foundations_of_Differentiable_Manifolds.pdf.
Abbaspour, H. & Moskowitz, M.A. (2007). Basic Lie Theory. World Scientific.
Miller, W. (1968). Lie Theory and Special Functions. New York: Academic Press. https://www.ima.umn.edu/~miller/lietheoryspecialfunctions.html.
Ebrahim, E. (May 19, 2010). A Self-Contained Introduction to Lie Derivatives. web.math.ucsb.edu/~ebrahim/liederivs_tame.pdf.

Matter

Isolated material particles are abstractions, their properties being definable and observable only through their interaction with other systems.

—Niels Bohr, 1934
Atomic Physics and the Description of Nature

Periodic Particle Table



Quantum Morphology

At best, physics bundles related groups, and tucks new matter creation under confinement and quantum fluctuation uncertainty.[1] This is due to observational perspective limitations. Biology has already established correlate language and processes for creation and sequential evolution we can apply reconstructing matter from nature's perspective.

Morphology is a study of formation, structures, changes and use of a key component in a field (e.g. word in linguistics,[2] spatial structures in physics,[3] etc.). Morph~ means to change form. Matter comes into form as new (morphogen), evolves (anamorph), compounds (morphotrope), and synanomorphs (multi-forms of the same). Let us begin with sequence.

We have five out of six types of strong interaction to cover in this chapter. All of these types are particle interactions in the hadronization and isotope processes.

I. Morphogenesis—instantiating new matter. Next chapter.
II. Primordial Bonds—joining 2 colors into type I Weyl fermions and 3 colors into type II Weyl fermions.
III. Primordial Entanglements—forming common identity of microstates by sharing available change spaces as bands (photons and most gluons).
IV. Ambiguous Transitions—4-6 primordials in complex entanglements (gluon singlets) including constriction into temporary volume-surface identities (weak bosons).
V. Mixed Layer Bonding—gluon-photon sets form type II core and surface bonds as flavors form an intermediary mantle (quarks and into hadrons).

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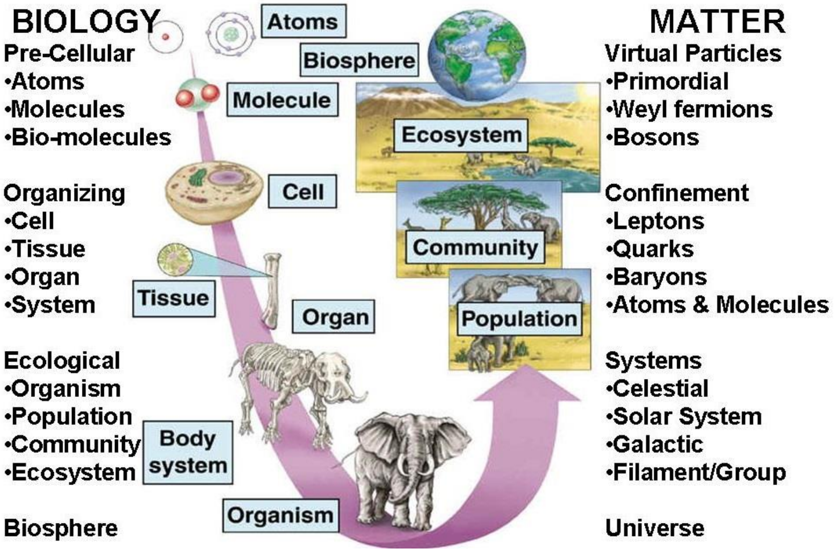
[1] Gilman, L. (2018). Virtual Particles. Net Industries. science.jrank.org/pages/7195/Virtual-Particles.html.
Jones, G.T. (2002). The uncertainty principle, virtual particles and real forces. Physics Education. hst-archive.web.cern.ch/archiv/HST2005/bubble_chambers/BCwebsite/articles/06.pdf.
[2] Aronoff, M. & Fudeman, K. (2011). What is Morphology? 2 ed. Wiley-Blackwell. abudira.files.wordpress.com/2014/03/mark-aronoff-kirsten-fudeman-what-is-morphology-fundamentals-of-linguistics-second-edition-2011.pdf.
[3] Mecke, K.R. & Stroyan, D. eds. (2002). Morphology of Condensed Matter: Physics and Geometry of Spatially Complex Systems. Springer.

VI. Fermi Band Bonding—bonds between available color bands. Fermi surface bands offer both weak interaction and strong bonding potential to form nuclear isotopes.

Generations of Matter

The hierarchy of life/biological organization has 12 levels[4] analogous to the hierarchy we call the generations of matter. We are dividing these levels into four groups: pre-cellular (atoms, molecules, macromolecule/bio-molecular complex), organizing (cell, tissue, organ, organ system), ecological (**organism**, population, community, eco-biome), biosphere (the whole).

The pre-cellular group is everything physics would call virtual: primordials (color charges), Weyl fermions (bound colors), and bosons (ambiguous loose interactions). These are so primitive they can only be real (e.g. biological) by being confined (in organic context).[5] Note: macro/bio-molecules are omitted from the image but not the listings.



Confinement is organization. It begins with the simplest that can exist independently (leptons) followed by states dependent (quarks & baryons) on the independently functional

[4] Solomon, E.P.; Berg, L.R.; & Martin, D.W. (2002). Biology. 6 ed. Belmont, CA: Brooks/Cole.
[5] Image (modified): Pen, J. (2013). Introduction to Life Science & Biology. Heartife. https://www.slideshare.net/JuliePen/intro-to-life-science-biology.

(organism is equivalent to atoms and molecules of physics). These coordinate into ecosystem levels. You, as a complex organism, are an ecosystem unto yourself.

A population of ecosystems interacts as a community forming a nested system called a biome. Nesting means putting one equivalent inside another. A macromolecule, for example, describes a molecule pattern with potential application. These patterns can be and often are extremely intricate with more member atoms than can be independently counted. They nest and compound.

This speed bump of nesting massive numbers of atom and molecule groups is the same in physics, just in a different point of the modeling. The entire biological model gets squeezed (nested) into only two generations of physics. Stages from macromolecules to biosphere nest into the celestial organism (e.g. planet).

Organisms form system populations in galactic communities, themselves members of a local system of galaxies. The totality of all these is the whole universe—or biologically the biosphere.

The image suggests the hierarchy is cyclic. In effect, the physical state of the biosphere is synonymous with that of the universe of physics generally. High level changes affect everything from the bottom up.

The cycle is completed by redistribution of value (light), which would be the zeroth (0^{th}) generation. It is zero because it isn't actually matter. It is the connection between whole and its most finite and numerous parts.

This connection is "virtual" meaning the parts cannot be examined individually but only together in a confined system. This is also true of the Abstraction Layer of the architecture, making the universe generally virtual.

The universe (biosphere) is first AND last—technically part of the first group of levels (pre-cellular). From a biological perspective, a change in the weather is a biosphere issue affecting from atoms up the entire hierarchy of levels.

The same is true in physics. Ability to affect everything from the bottom up increases with advance in levels (generations). A local group phenomenon like a gamma ray burst, manifests from the bottom of the process up.

Virtual Particles

Virtual particles baffle many. They look at something like a weak boson and see mass. It must be real if it has mass right? Wrong. Real is also no guarantee of stability. Virtual existence is environment specific and generally occurs as a confined feature in transition—a "transient fluctuation"[6] or disturbance.

Chromodynamics is a Quantum Field Theory (QFT) using additive and subtractive colors as quantum numbers. The colors have non-commutative features making them non-abelian. They are used to describe strong interactions initially among quarks and baryons, mediated by gluons.[7]

Virtual particles divide into three families: primordials (color charges), Weyl fermions (volume flavors), and bosons (transitional particles). Bosons further divide into photons, gluons, and weak bosons. Of these, primordials only exist, even as virtual, in a relationship—even if that is interacting with their own reflections as photons. They are always mathematical objects.

This diagram is not an indication of ordinary structure. It illustrates content, interaction, and resulting identity. Virtual chirality (sign and color) is an anti-particle analog. It evolves conceptually into helicity (weak sign) and relativistic anti-particles later. Virtual chirality is not an anti-matter indication.

Primordial (Color Charges)

As quantum numbers, the universe does not make much distinction among primordial color charges and gives them no individual existence. Primordial color identities exist strictly as mathematical containers within other identity interactions like microstates. The absence of interaction skips past primordial to annihilation as light (generation 0).

Color identities swap places like a flag blowing in the wind. That analogy is pretty useful because the flag has no control. It is attached to a pole and that determines the limited directions it can blow. The pole would be analogous to a common color identity.

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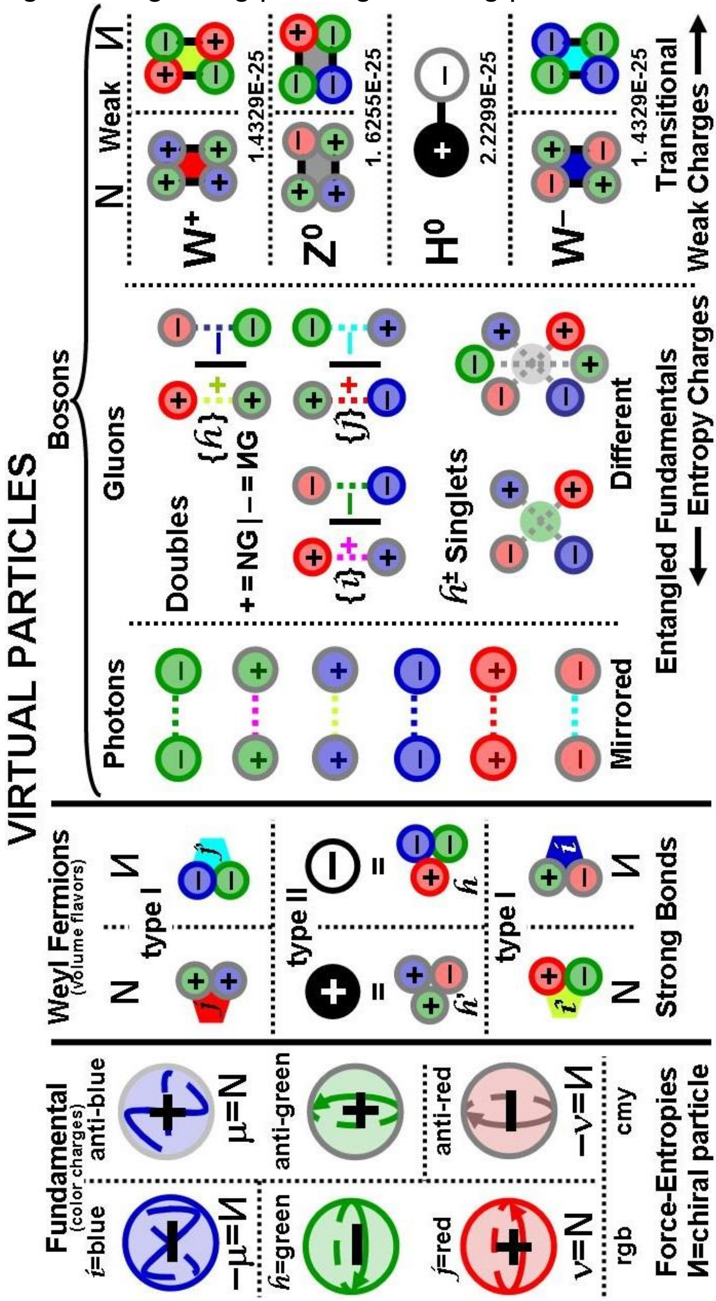
[6] Thomson, M. (2017). Modern Particle Physics. Just the Facts 101 ©.

[7] Manoukian, E.B. (2016). Quantum Field Theory I: Foundations and Abelian and Non-Abelian Gauge Theories (Graduate Texts in Physics). Springer.

Without the pole, the flag simply blows away. The same is true with color charges. Even though they offer a change function, they need a secondary system to begin grounding them—grounding being planting said flag pole.



One can reasonably argue that primordials never occur, except they do in the most obvious of all places: photons. We can make this argument because a photon is a primordial that divides its value and interacts with its own reflection. Aside from generalizations of the wave functions, photons are too confined to make color charge distinctions. Take away interaction and primordial is annihilation to generation 0 (light).

Weyl Fermions (Flavor Volumes)

A Wyle fermion consists of the intersection of two or three primordial axes. Such an intersection is a type II strong interaction consistent with part of the strong bonding actions of quarks. It happens when the in-phase volume spaces of the primordials contact. The intersection forms a volume. Instead of an intrinsic surface, the interaction provides a color quantum number as potential for entanglement into a lepton.

Conventionally, Weyl fermions are reported as consisting of a volume with an attributed Fermi surface—what we have called a negative space. “The Fermi surface is the surface in reciprocal space which separates occupied from unoccupied electron states at zero temperature.”[8]

Such a negative space on this level violates relativistic Lorentz symmetry. This is an over-fancy way to explain the volume-surface requirements for the GFE are not adequately satisfied to provide an intrinsic mass value. It is also important to condensed matter physics where Luttinger’s theorem shows particle density as a function of Fermi surface-enclosed volume.[9]

“Condensed matter” describes degeneration—the process of matter fully occupying its space. Degeneration re-establishes change function order, such that EMR and EMA values begin to differentiate. An EMA Fermi surface offers minimal restrictions and useful guidance to passing energies. Adding momentum, however, actualizes the GFE.

There are two general designations of Weyl fermions. We provide a total of six specific particles consistent with resultant

[8] Dugdale, S.B. (Apr. 18, 2016). Life on the edge: a beginner's guide to the Fermi surface. The Royal Swedish Academy of Sciences. http://iopscience.iop.org/article/10.1088/0031-8949/91/5/053009.

[9] Halboth, C.J. & Metzner, W. (1997). Fermi surface of the 2D Hubbard model at weak coupling. Springer. https://link.springer.com/article/10.1007/s002570050318.

flavors of their entanglements (affecting leptons and quarks). We designate all Weyl fermions consisting of only two bound parts (rg, bg, cm, my) as **type I** (Roman numerals). These all provide a color band potential.

Weyl fermions consisting of three parts (rgb and cmy) are **type II** noting their band potentials are quasi-temporal but time-neutral (t^o). This gives them polarization such that they show different potentials between aspect positions. It also leaves them vulnerable to environmental flavor changes. Most useful of all, this allows them to bypass other color variables to act as nucleation and surface for nucleons.

Our type II definition agrees with and expands on: "The type 2 particle exhibits very different responses to electromagnetic fields, being a near perfect conductor in some directions of the field and an insulator in others."[10] Fermions are known to have three flavors.[11] Our Weyl fermion definition shows them as the root of flavor and the subtleties affecting charge.

Unbound Identies

Type I strong interaction is instantiation (next chapter). Type II strong interaction is bonding to form Weyl fermions. Type III and IV strong interactions are entanglements and the transitional weak bosons.

Types III & IV are not firmly bound like the axis conjunction of sharing phase spaces in type II. They start with what are commonly called entanglements. An entanglement at this level is basically a pseudo-strong bond. It occurs in the out of phase surface and axis space.

Generation-wise, the result is two generations above the parts. Entangled (strong type III) primordials are bosons. Weak bosons specifically are entangled in presumable transition to bound and entangled. They are given the separate designation of type IV strong interaction because their microstates simultaneously provide surface and volume resolutions, where type III just adds a surface to the parts.

[10] (Nov. 25, 2015). 'Material universe' yields surprising new particle. Princeton University. https://phys.org/news/2015-11-material-universe-yields-particle.html.
[11] (May 23, 2017). Weyl fermions exhibit paradoxical behavior. Leiden Institute of Physics. https://phys.org/news/2017-05-weyl-fermions-paradoxical-behavior.html.

Photons

The only clear distinction between primordial, light, and photon is focus. To create a photon, a primordial interacts with itself by dividing its resources in three more compact spaces. It can now use these spaces to play hot potato with the never-resting light value.

Light-primordial-photon all have the same wave qualities that can be used to generalize color identity. The moment you plant this flag someplace, it becomes less generalized. The reason it is generalized is the helical (mirrored) quality of the parts requiring synchronous (neutralizing) bands.

The change function of any interaction is antithetical to the interacting parts. A direct chiral (red-cyan) neutralizes the change function and is therefore not allowed. That leaves magenta and yellow as potentials for red to participate as a part.

When the parts are identical, as with photons and charged leptons, the parts rotate to mirror each other. Red on red provides either magenta or yellow, but the rotation shows as r–r with g:m|b:y bands. These alternate in microstates. As a time-neutral confining surface, they mask and impede color specifics and interactions.[12] Photon adaptability makes them perfect building blocks in material evolution.

As in all such cases, time neutral creates an environmental susceptibility and opportunities. A lens filter easily changes color identity shaping the light. Indeterminate color is a quantum tunneling way of getting around other color interactions. This makes quark anatomy ambiguous, but simplifies topolaritons.

The rotation affects synchronicity (see pg. 91) differently for simple band pairs versus flux tubes. Photons are synchronous, where a similar muon's (my–my) flux tubes are asynchronous. The reason is that each primordial is offering band potential. That means rgb|cmy offer three band potentials each.

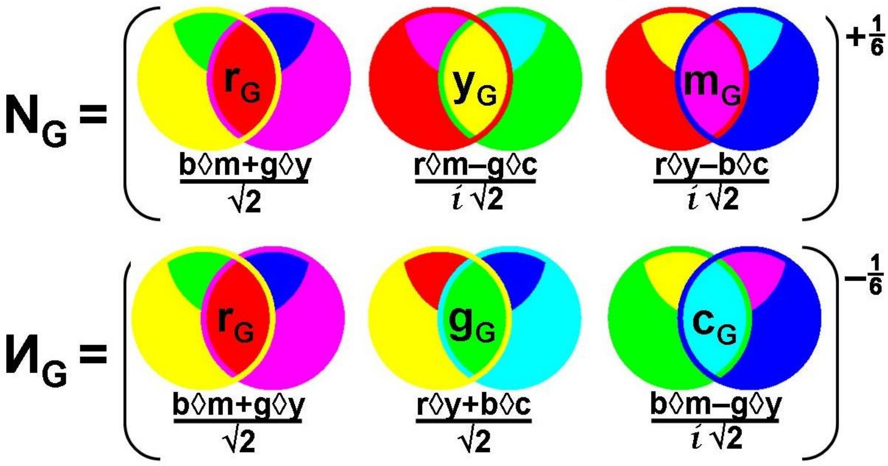
[12] Hansen, L. (Feb. 27, 1997). The Color Force. webhome.phy.duke.edu/~kolena/modern/hansen.html.

Gluons

We simplified color-anti-color to additive-subtractive for accessibility purposes on many levels from keyboard characters to actual coloring. While we still use the same definitions[13] (below), we simplify them into collective identities as shown above, and provide ◊ to indicate swap uncertainty.

We add a weak charge equivalence layer to the definitions to aide in understanding quark charges. When alternating with a photon, the photon also has an equivalent attributed ±1/6 weak charge. This way, two gluons or a gluon and photon combine with a lepton to make a quark.

Confined Gluon Color to Weak Charge Equivalence



There are actually eight gluons, but we separate the gluon “singlets” as ambiguous like the weak bosons. The six basic gluons are simply entangled color and anti-color of different types that swap color/anti-color roles but retain the same confining entanglement surface identity.

All gluons are strictly surfaces entangled with other surfaces. They have no mass because there is no volume for a surface to interact with. Adding energy into them expands and rotates their bands. Sudden discharge of that energy is called snapping.

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[13] Griffiths, D. (1987). Introduction to Elementary Particles. John Wiley & Sons. pg. 280. ia800909.us.archive.org/5/items/GriffithsD.IntroductiontoelementaryparticlesWiley1987/GriffithsD.Introductiontoelementaryparticles%28Wiley%2C1987%29.pdf

Energy can quantize resulting, the snap splitting into two new gluons, each gluon having half the parent's parts—analogous to quarks.[14] An r(g) gluon has gy or bm parts. Assuming either gy or bm at division provides the same offspring: y(g) and m(g). This is a form of instantiation (morphogenesis) we term mitosis—the offspring have the same scale and number of parts as the parent.

Ambiguous Cases

There are two types of ambiguous cases, both of which involved complexes of four or more entangled primordials. Gluon singlets are equally entangled red-green, or red-green-blue photons. All gluon and photon interactions apply.

The singlets are out of phase strong type III entanglement interactions. When their phase volumes interact, they become weak bosons. Conversely, weak bosons devolve into distinct gluons.[15] Which weak boson depends on the specifics, which is a key difference between type III and IV interactions.

Unlike the primordial entanglement, the type IV interaction limits color axes. This is a required level of stability to establish volume even temporarily. Z bosons juggle rg:bg volume:surfaces together to neutral, just as the Higgs does rgb:cmy. For charges, W bosons do rg OR bg separately.

Despite similarities, only the rgb singlet stands a chance of direct translation. To reiterate, the key differences between singlets and weak bosons are:

- Singlet parts interactions entirely occur outside phase range (not allowing volume)—gluon/photon primordials.
- Weak boson parts interact in and outside phase range at the same time—as primordials AND Weyl fermions.
- Singlets utilize all their parts and interactions where weak bosons limit their parts and interactions.

Weak Confinement

Weak bosons provide a basic template upon which confinement builds. Key to this template is the emergence of

[14] Butterworth, J. (July 18, 2010). Quarks, Gluons and Jets. lifeandphysics.com/2010/07/18/quarks-gluons-and-jets/.

[15] Djouadi, A. (Dec. 1997). Decays of the Higgs Bosons. Université Montpellier. cds.cern.ch/record/340786/files/9712334.pdf.

Fermi surfaces (negative spaces) resulting from optimizing the use of space. This evolves chirality into the concepts of helicity (weak charge) and anti-matter.

The interactions responsible are among parts of different scales and their composites of different magnitudes. The complex interactions force differentiation of quantum local from relativistic group fields. Only where these satisfy GFE requirements do relativistic qualities like Fermi surfaces, momentum, and mass apply.

Bands providing negative spaces get conditionally used, or are left available. Gluon and photon bands are the same magnitude, but they define the magnitude of bands. All further bands and flux tubes, no matter how many, are of that magnitude.

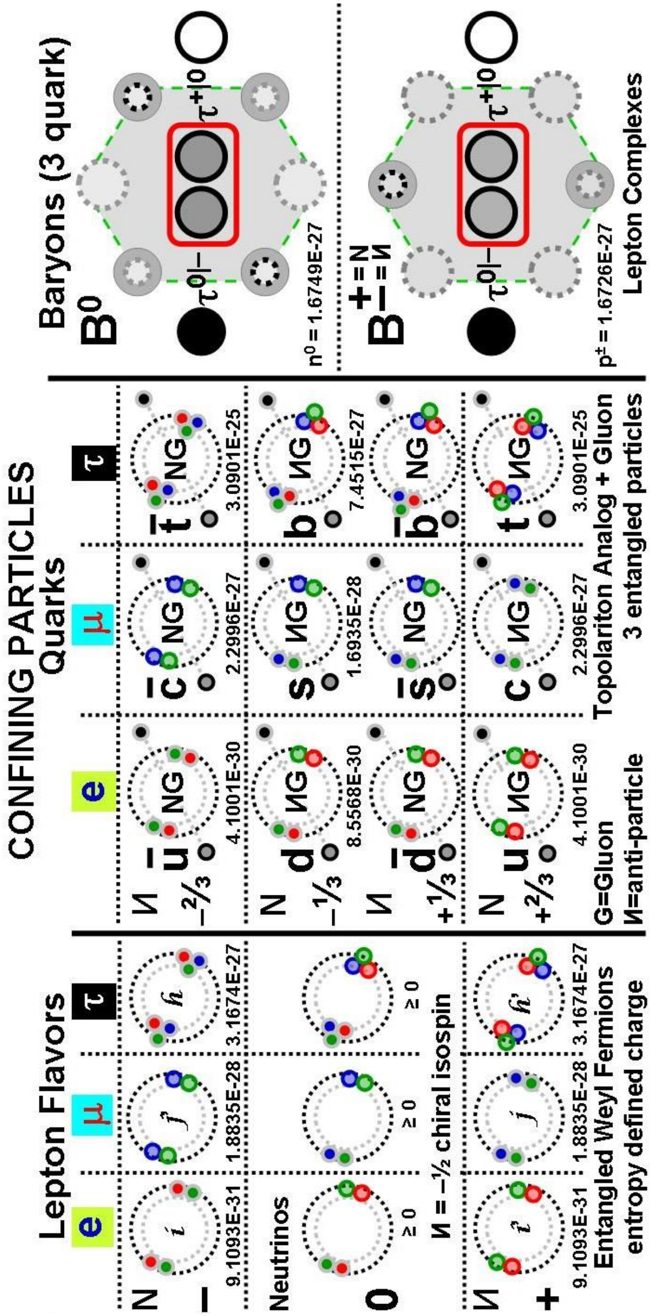
Conditional use reduces charge potential (e.g. with photons and gluons in quarks). Unconditional availability, as with leptons, leaves a simple unit of weak charge potential. Split availability is even more common, confining the potentials for how matter can evolve as seen with neutrons.

Confining naturally aims for units: quantization. This makes quarks and sub-quark topolaritons intermediaries like weak bosons but for different reasons. Combined to form baryons, the real players are Weyl fermions tightly wound in confining layers of lepton interactions. Little space is left locally available—just enough to create x-rays, weak bosons, and other primordial soups.

Leptons

Each lepton consists of an entangled pair of related Weyl fermions (flavor volumes). Neutrinos are a simple chiral pair causing their flux tubes (band pairs) to twist over themselves. Photon bands have a polar twist, like one subject stands on their head. Flux tube twist is like having one subject turning to face away from the other. Either way, bands cross (synchronize).

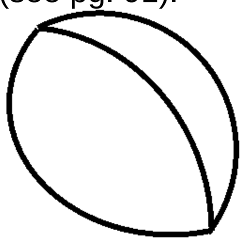
Without momentum, synchronicity deprives neutrinos of relativistic qualities. Inconsistent microstate distribution of value among volume and surface also limits relativistic qualities. Unlike photons, the resulting motion is relativistic, so part of the observed mass is intrinsic momentum. Note: we prefer the particle table (pg. 100) so no one gets confused that these particle breakdowns can be viewed as literal geometries.



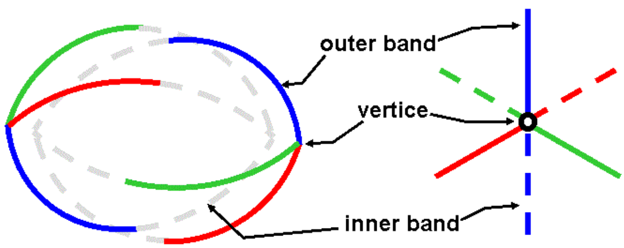
After neutrinos, deriving charge from flavor source chirality is more complex. Primordial colors merge in each Weyl fermion to the equivalent flavor concept. The change function associated with the color surface is now evaluated as a volume. The volume is the result, and the color assigned to the flavor is its potential. The first field sign in the color's change function is the lepton charge (ι’, ȷ, ɦ’=+; ι, ȷ’, ɦ =–). Notice ȷ and ȷ’ cross over.

With gluons we discussed red having magenta and yellow potentials. The subsequent interaction defines which potential actualizes. In a bond, as with red and green, only yellow remains available. Each entangled identity offers a pair of yellow (ι’) bands. To complete the interaction, one must either have or fake ι bands by rotating (equatorial) aspect.

Color interactions strive for cmy and rgb combinations. Even though opposites are chiral, they can rotate to imitate each other, as with e^{-}=rg–rg. The bands should all be yellow, except the rotation creates a pseudo-blue. Conversely, an electro-neutrino is additive rg+cm with synchronous bands (see pg. 91).



Michael Evans' Trion



Crossover Entanglement Bands

More baffling are the trion-shaped bands of rgb and cmy (Type II Weyl fermions). Michael R. Evans named this shape “trion re” for its shape and the crystalline prism effects it has on light. Of course the quantum universe couldn't just leave a shape so simple. True to form, given two potentials, the quantum universe is happy to utilize both at its convenience.

The trion with rgb bands consists of entangled cmy at the vertices (ends) where rgb intersect. They don't intersect at the equator because they are rotated to appear as cmy intersecting rgb relative to each other. More ambiguously, the band associations swap places since they are not fixed commodities and each interacting primordial has two potentials.

This sounds like purely academic detail except it is extremely relevant with type VI (6) of the strong interactions: trionic band bonding among baryons. We will simply call these tau bands since they only occur with the tau flavors.

Their bizarre quasi-temporal nature makes tau bands vulnerable to oscillation,[16] identity change, and ideal for their unique role in hadrons. That role can easily be described as a quantum tunneling-style system of entanglement. The bands in use are whatever (color) quantum number is available. Similar opportunism is rampant in gluon singlets and weak bosons.

Quarks

Quantum number convenience is the name of the quark game. Each quark is flavored by a lepton (μ, e, τ) providing base charge. This is populated by a gluon-photon pair alternately interacting as two gluons modifying the base charge. A photon-lepton combination is known as a topological polariton (topolariton).[17]

Gluons and photons do not have weak charges, unless they are injected in an interaction creating a weak field. Then their individual effect is 1/6—likely due to swapping with two gluons. As with the leptons above, the first sign of the entangling change function is the sign for the gluon. The photon follows the gluon's suit, which means its primordial parts begin with the opposite sign.

The gluon-photon pair have equal charges in the same direction affecting the charge by ±1/3. Strange (μ), Down (e), and bottom (τ) quarks are flavored by a neutrino. The gluon-photon pair gives them 0±1/3 charge. Charm, up, and top quarks are flavored by a charged lepton. The gluon-photon charge effect is ±(1–1/3)=±2/3.

[16] Affects mass attribution $\Delta m^2 L/E$. Boyd, S. (Mar. 24, 2015). Neutrino Oscillations. https://warwick.ac.uk/fac/sci/physics/staff/academic/boyd/stuff/lec_oscillations.pdf.

[17] Refael, G. et al. (Jul. 1, 2015). Topological Polaritons. CalTech. https://journals.aps.org/prx/abstract/10.1103/PhysRevX.5.031001.

Hadronization

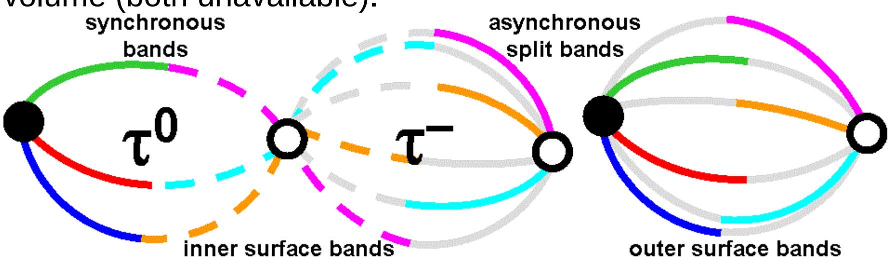
Quark bonding is more like the nested meshing of a novelty puzzle ball (below). We are terming it strong type V (five) because it has unique elements. Like the puzzle ball, parts from the surface also make up the core, while others simply mesh like a layer of filler.

From a dissection perspective, this complex system is too compact and offers too many ways to break down. To describe its formation is simply strong bonding is to not give the full set of responsible interactions credit.


[18]

The quark's identity is almost completely lost. The gluon-photon sets alternately form type II bonds—more Weyl fermion components. These come in tightly wound layers and cross-layers of flux tube band pairs. At the core of a hadron, for example, is a degenerate Higgs boson. It is degenerate because it is only its volume.

Gluon-photon bands in quarks already conditionally passed through a lepton layer, separating their halves between outer and inner. For hadrons they now form tau bands holding an outer-core of Weyl fermions and their mantle of lepton-like interactions between outer membrane and core volume (both unavailable).



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[18] (2018). 3 IQ Puzzle Ball. Littleton, CO: Dollar Item Direct. dollaritemdirect.com/iq-puzzle-ball.aspx.

The membrane includes volume and flux tube bands available as Fermi surface. They can weakly interact and have strong type VI bonding potential. This numbering is convenient for remembering that type V occurs between quarks of generation 5 and type VI among baryons of generation 6.

The separated surface is very important. It deprives the Higgs core from a direct GFE interaction leaving it a quantum variable in this respect. The leptons that were quark flavors now make up the outer core and mantle layers of the baryon. This layer is another membrane: a surface with depth. Baryons thus have two membranes and a volume filled in part or completely (as with nucleons).

Instantiation

Every story has a beginning, middle, and end. The quantum universe is a setting, not a story. Settings are timeless unless you happen to be the weary traveler stuck taking the long way through the pages of a story.

In physics, matter is the plotline. It determines beginning, evolution, and end. The story is a unique combination of substance in motion changing to its local conditions. The story is evolution. Evolution can play any role in the existence of matter from creation to termination—arguably every role.

Using story elements invites ethical dialogs like: What is the purpose of ____? Science and the physical universe simply apply definitions in context. Being a definition in context plays a role in transformations and evolution on many levels. These roles can be active, passive, giving, or receiving, like being redefined by local turbulence.[1]

Strong Type I

The four reproductive phase-stages of mitsosis/meiosis[2] outline the first type of strong interaction: creation of new matter at any scale. This is a presumably passive process of quantum fluctuation associated with Heisenberg uncertainty and confinement.[3] The particle or otherwise available spacetime is acted upon, accumulates, reacts, and diverges into multiple forms (cladogenesis[4]).

The first two stages provide explicit details of interphase—routine existence. Each consists of a sequence of sub-

[1] Richings, R.J. & Faucher-Giguère, C.A. (Nov. 23, 2017). The origin of fast molecular outflows in quasars: molecule formation in AGN-driven galactic winds. Oxford Academic. academic.oup.com/mnras/article-abstract/474/3/3673/4655190.

[2] Hartwell, L.H.; et al. (2008). Genetics From Genes to Genomes. New York: McGraw-Hill.

[3] Gilman, L. (2018). Virtual Particles. Net Industries. science.jrank.org/pages/7195/Virtual-Particles.html.

Jones, G.T. (2002). The uncertainty principle, virtual particles and real forces. Physics Education. hst-archive.web.cern.ch/archiv/HST2005/bubble_chambers/BCwebsite/articles/06.pdf.

[4] McClean P. (1997). Population and Evolutionary Genetics: Speciation. ndsu.edu/pubweb/~mcclean/plsc431/popgen/popgen6.htm.

processes. The references provide a better outline of the cellular analogs that do not always convert directly into the new matter process.

Prophase establishes the reproductive potentials (leptotene, zygotene, pachytene, diplotene, diakinesis[5])
Condense—available focalizing spacetime, like color charged attributed value spaces (bands);
Conjugate—paired groupings or topological ordering;
Connect—pair mirroring or symmetry;
Crossover—energy connecting exchange like microstates and oscillation;
Confine—Fermi surface encapsulation.

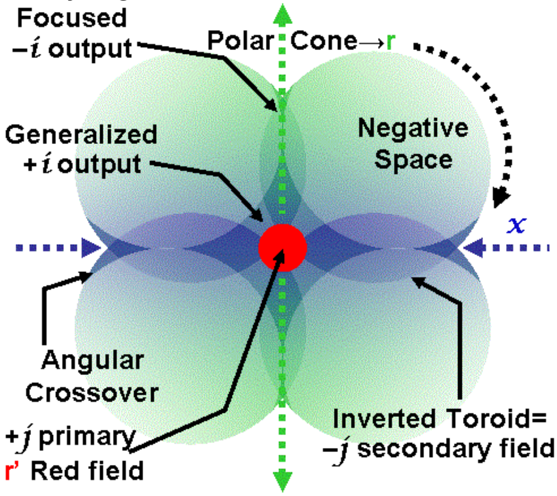
Metaphase—spindling[6]/value fills a confining change shape:
Adjacency—capture/focus of value;
Configuration—information mirroring, distribution, and smoothing;
Carry/Accumulation—energy not lost compounds with new adjacency up to…

Anaphase—conception/establishment of new (sister parts separate[7]):
Quantization—establish unit identity proportional to contextual availability;
Snap—attributed space separates from acquired value;
Rip/Unzip—radiant value divides by absorption into chiral units;
Alignment—initial interactions of new parts.

Telophase—differentiation/separation into distinct identities[8]:
Cycle initiation—microstate cycle of new parts and interactions;
Re-alignment—interactions and chirality of parts established;
Conflict resolution—quantum number swapping/leaping to tunnel or jet through exclusion conflicts;
Confinement—into prophase/interphase.

[5] Staveley, B. (2017). Principles of Cell Biology. Memorial University of Newfoundland. mun.ca/biology/desmid/brian/BIOL2060/BIOL2060-20/CB20.html.
[6] Kimball, J. (Apr. 5, 2014). The Centrosome. biology-pages.info/C/Centrioles.html.
[7] Kimball, J. (Apr. 5, 2014). The Cell Cycle. biology-pages.info/C/CellCycle.html.
[8] Miko, I. ed.et al. (2014). Telophase. nature.com/scitable/definition/telophase-128.

It is easy enough to envision perturbations of virtual particles forming and evolving through this process in the band spaces of particles. Imagining this in the complex field spaces of a galaxy developing confined and system matter is a bit harder. It seems further complicated by having not one but two types of field generators (cyan and red singularities). Shape is the only significant difference.



The image above illustrates the generic field condition of the universe acting on a red singularity. There are color-predisposition spaces in the field where x-ray (+ι) and gamma ray (–ι) emissions regularly occur. There are vast spaces where seemingly nothing occurs (negative/unused space). Around these is a toroidal feedback system.

The universe of things acting on the singularity generates a toroidal field. It is not an ordinary magnetic field, but it is a member of the family of electromagnetic fields. Ordinary magnetic fields also occur, but they are not as effective at steering the direction of matter let alone light.

You cannot see a beam of light from the side unless it is reflected off something and comes straight into your eye. The light caught in this field also cannot be observed without it reflecting off something, like the light reflecting off the rings of sombrero galaxies and gas clouds on galactic rims. This isn't just stellar light reflection.

Despite the illustration not accounting for system information, there are clear focal points. At these points, energy and/or matter focus resulting in new and evolving matter from virtual photons to solar systems and everything between. Galaxies literally create everything from seemingly nothing.

Initially the information is negligible allowing the creation of hydrogen (Lyman-α=1216Å wavelength) evolving from simple emission to stellar break.[9] When we add in system information, the perturbations become complex dynamics. Information evolves in these dynamic systems as the complexity of matter evolves.

Cladomorphology

A clade is a group classified by common ancestry.[10] This term is problematic in physics where more than one path to the same outcome is expected. The plot paths of change are more easily classified. It is in these contextual paths that matter stories emerge, unfold, evolve, and end.

Darwin's conception of evolution of the fittest suggested a gradual system of adapting to the environment. This led anthropologists to seek a clean progression in human evolution from primates. The conception has only a limited degree of truth. Selective breeding shows dramatic changes happen from one generation to the next with a significant and consistent behavior change, like domestication.[11]

In thermodynamics, enthalpy (H) describes the total energy of a system in a change of state (e.g. solid-liquid-gas). It is a function of heat (E) and pressure (p) applied to a volume (V): $H=E+pV$.[12] The same concept is true for biological evolution in that change in behavior (E) is combined with the motivation (p) of a population (V).

As a change boundary condition, enthalpy can be thought of as a quantization value. This can be triggered via enthalpy equivalent relativistic momentum. For particles, the behavior

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[9] (2012). Lyman-Alpha and Lyman-Break Galaxies Hubble/ESA and NASA. http://hubblesite.org/hubble_discoveries/science_year_in_review/pdf/2012/exploring_lyman_alpha_and_lyman_break_galaxies.pdf.

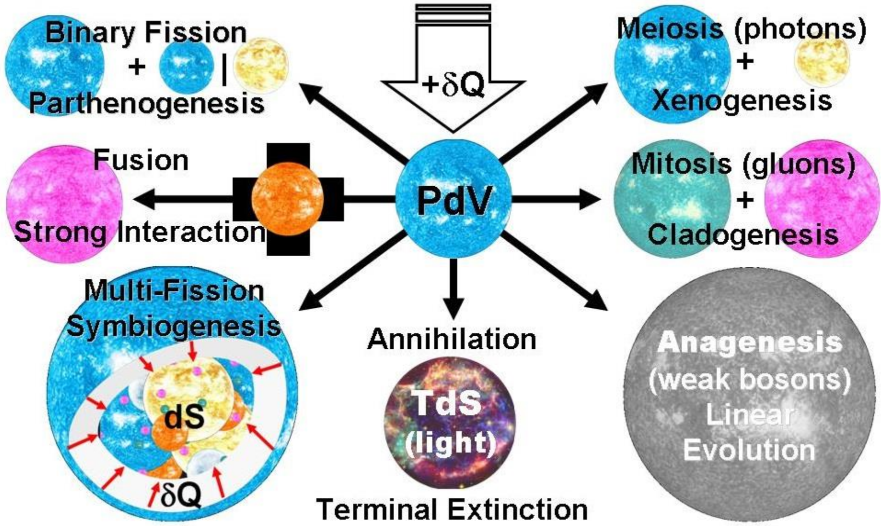
[10] Polly, P.D. (2013). Phylogenetic definitions of taxonomic groups. indiana.edu/~g404/Phylogenetic%20definitions%20of%20taxonomic%20groups.pdf.

[11] Trut, L.N. (Mar.-Apr. 1999). Early Canid Domestication: The Farm-Fox Experiment. American Scientist, Vol. 87.

[12] Hall, N. (May 5, 2015). Enthalpy. grc.nasa.gov/www/k-12/airplane/enthalpy.html.

change appears in oscillation—periodic motion consistent with identity.[13]

Oscillation is a product of intrinsic information and is subject to normalization conflicts with transient information. The longer transient energy remains, the more their separate information normalize. This consistency and other environmental pressures increase the probability of change at and beyond enthalpy as shown in neutrino studies.[14]



Enthalpy is the trigger for change in the illustration when thermodynamic energy (**δQ**) applies to a contextual (PdV) path. We assume the path is material, but it can be a field or incidental focus, creating a loophole in the material requirement for creating new matter. There is always more than one way to twist the plot.

Here, energy is vaguely defined as a capacity for work (**δW**).[15] Mass contains capacity and resists work. Time contains and resists changes where work applies. The work here is evolution or creation of matter. We will call the creation of a new matter object **instantiation**.

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[13] Evans, L. (2010). Oscillations. webhome.phy.duke.edu/~lee/P53/osc.pdf.
[14] Kayser, B. (2011) Neutrino Oscillation Physics. Batavia, IL: Fermilab. hep.wisc .edu/~sheaff/PASI2012/lectures/BorisK-Oscillation.pdf.
[15] Nave, C.R. (2017). Work Energy Power. Georgia State University. hyperphysics .phy-astr.gsu.edu/hbase/work.html.

Instantiation—The contextual process of bootstrapping a material identity into existence; the creation of an actual object instance in a context (object) oriented system[16].

Instantiation establishes an active change function generally in the space of an inactive change function (e.g. entanglement band). Another is signal interference, which is a temporary perturbation—a virtual instantiation. Instantiation is opposite to annihilation where a change function is lost with value evaporating as light.[17]

The assumption of instantiation is spontaneity. An identity is called into or out of existence like a virtual entity. Such spontaneity is generally classified under quantum fluctuation and Heisenberg uncertainty.[18] Virtual particles (primordials, Weyl fermions, and bosons) are always instantiated—commonly by mitosis and meiosis (later).

Singularities are virtual identities, as is the case of extreme degeneracy (extreme pressure-density[19]). Both are generally a byproduct (stellar remnant[20]) of parthenogenesis (binary fission) splitting an existing identity[21].

Confined particles tend to emerge in complex high energy and pressure systems like stars (e.g. neutrino synthesis[22]). Such a complex breakdown (fission) creates not one but many types interactively. The interactions form cooperative fission-fusion cycles like hadronization and nucleosynthesis.[23] Such cooperative evolution is symbiogenesis.[24]

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16 Rouse, M. & Macleod, J. (Sep. 2005). WhatIs.com: Instantiation. whatis .techtarget.com/definition/instantiation.

17 Strassler, M. (Mar. 25, 2012). Partilce/Anti-particle Annihilation. profmattstrassler .com/articles-and-posts/particle-physics-basics/particleanti-particle-annihilation/.

18 Županči̇č, A.O. (Jul. 17, 1965). Creation Rate of Matter and the Heisenberg Uncertainty Principle. Nature: 207, page 279.

19 Carroll, B.W. & Ostlie, D.A. (2006). An Introduction to Modern Astrophysics. 2 ed. London, UK: Pearson.

20 Sulehria, F. (2005). Stellar Remnants. novacelestia.com/space_art_stars/ stellar_remnants.html.

21 (2018). Binary Fission. Cornell University. micro.cornell.edu/research/ epulopiscium/binary-fission-and-other-forms-reproduction-bacteria.

22 Larson, K. (2006). Neutrinos! University of Wisconsin, Madison. astro.wisc.edu/ ~larson/Webpage/neutrinos.html.

23 Terzian, Y. & Herter, T. (Oct. 17, 2012). Stellar Energy and Nucleosynthesis. Cornell University. www.astro.cornell.edu/academics/courses/astro1101/lectures/ 13StellarEnergyNucleosynth.pdf.

24 Margulis, L. (1981). Symbiosis in Cell Evolution. San Francisco: W.H. Freeman.

Anagenesis is adaptation in isolation.[25] A familiar example among particles is the part of nuclear fission where a neutron becomes a proton. Another is stellar evolution. Systems evolve in the composition of their parts, like stars evolving toward heavy elements.

Oscillation is the common physics synonym for anagenesis due to intrinsic behavior change. Usually it is one identity transforming into another of the same class, like leptons and quarks changing flavors, photon filtering and gluon color changes. We can call these horizontal anagenic changes. A lepton transforming into a photon[26] would be vertical.

Baryogenic Asymmetry

The baryogenic asymmetry problem basically asks why atoms and the emphasis on matter over antimatter? Why do we see matter and antimatter created together but in the end see so little antimatter? In 1967, Sakharov suggested thermal equilibrium, Baryon number, and charge-parity (CP) symmetry violation.[27]

The study of new matter generally focuses on quarks undergoing mitosis splitting into quark and anti-quark pairs. It is low-energy and easy to observe. This is ONLY ONE way quarks can be created. Quarks were (and often still are) described as fundamental. We've seen they are far from it. They aren't even necessary to create baryons.

Baryogenic asymmetry is normal because the universe wasn't constructed by the same rules as our limited ability to observe it. Let us recall that chirality is a feature of virtual particles which are all more fundamental than quarks. Many particles consist of chiral or otherwise conflicting halves (photons, Higgs', neutrinos, down, strange, and bottom quarks). Helicity is a feature of confining relativistic particles (see pg. 43 et seq.).

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[25] McClean P. (1997). Population and Evolutionary Genetics: Speciation. ndsu.edu/pubweb/~mcclean/plsc431/popgen/popgen6.htm.

[26] Minkel, J.R. (Jul. 22, 2002). Two Photons Diverged. Phys. Rev. Focus 10, 3, https://physics.aps.org/story/v10/st3.

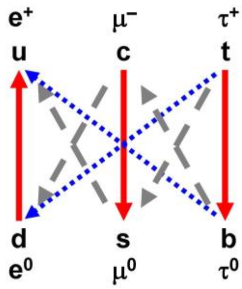
[27] Sakharov, A.D. (1967). Violation of CP invariance, C asymmetry, and baryon asymmetry of the universe. Journal of Experimental and Theoretical Physics Letters. 5: 24–27.

Virtual matter and antimatter work together to form confined matter of both types. An anti-down quark differs from an ordinary down quark only by its gluon-photon set. You cannot gauge ordinary anti-matter by virtual antimatter creation. Helicity is relativistic tying in with high-level phase conditions. The universe is left-handed. To retain ordered identity requires right handed predisposition.

Being brought into the universe together does not mean they die together. Left-handed helicity is associated with antimatter. It is left handed because the rotation and trajectory go opposite directions—naturally tearing the identity apart. It takes extra work to hold mu-matter (μ=disorder) together.

More pressing than the baryon asymmetry is the electro-flavor symmetry (electrons, down and up quarks, neutrons and protons). These are all based in electro (y|b) type I Weyl fermions consisting of red-green (rg|cm) ordered combinations. The y|b designation translates into Fermi surfaces. This is an ideal combination of having right-handed volume providing a null left-handed interface with the left handed universe.

The alternatives to electro-flavor are mu and tau. Charged muons and tauons have average life expectancies of $\mu^-=2.197\times10^{-6}$ and $\tau^-=2.906\times10^{-13}$ seconds.[28] These reflect their disposition to disorder versus the stable electro-flavors and neutrinos.



Primary decay paths are in red, secondary in dashed grey, and least in dotted blue. This follows the Cabibbo–Kobayashi–Maskawa (CKM) matrix.[29] Quarks decay from charged μ (charm) and τ (top) to stable neutrino (strange and bottom).

[28] Amsler, C. (2008). Particle Data Group. http://pdg.lbl.gov/2008/listings/s035.pdf.
[29] Ceccucci, A., Ligeti, Z., & Sakai, Y. (Feb. 2014). 12. The CKM Quark-mixing Matrix. http://pdg.lbl.gov/2014/reviews/rpp2014-rev-ckm-matrix.pdf.

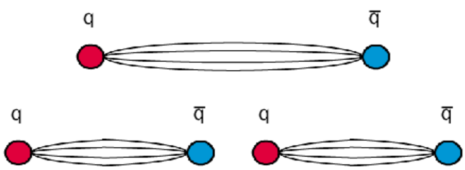
Stable electros, however, decay from neutrino (down) to +charged (up). +Up has right-hand oriented volume and surface. Baryogenic asymmetry is expected when virtual chirality pairing is not confused with helicity decays toward right-handedness.

Mitosis v. Meiosis

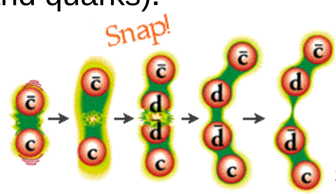
The words "new matter" imply the spontaneous creation of something from nothing—or at least completely unlike things. All matter is essentially energy value applied to change in a space ($m=E/c^2$). This is our list of unlike "nothings": value, change, and space.

The creation of something from nothing then follows one of two general paths: mitosis producing twins with the same number of genes, and meiosis quadruplets reducing the genes.[30] We will start with the particle version and double back later for grander scale productions. Among particles:

Mitosis—The creation of two new material identities with the same entropy but of opposite states. When formed, the new material identities entangle or bond separately with the parent particles (e.g. gluons and quarks).



31



32

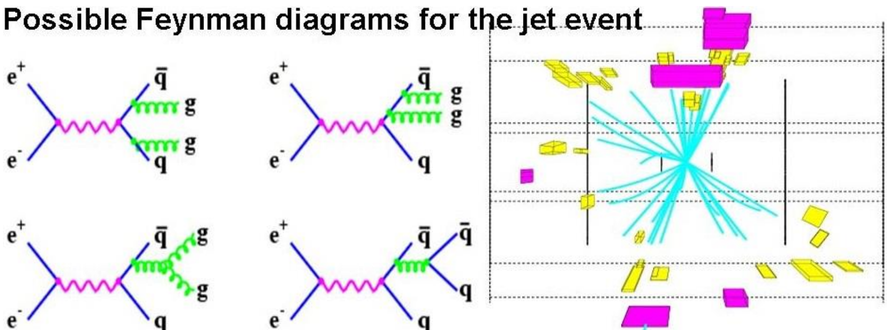
While this is known to occur among gluons, confinement makes quarks observationally accessible. As energy is added to bands, the bands rotate and expand until they snap at new identity formation. Alternatively, the pressure of collision can convert into workable energy to create new matter fitting the available change conditions of the colliding parts.

These snapping illustrations are better suited for gluon mitosis, with energy simply accumulating in the bands. Instead

[30] Scott, S. et al. (May 17, 2017). Mitoses versus meiosis. yourgenome.org/facts/mitosis-versus-meiosis.
[31] Breinig, M. & Hitchcock, J. (2012). The Standard Model. electron6.phys.utk.edu/phys250/modules/module%206/standard_model.htm
[32] Barnett, M. et al. (2014). Quark Confinement. particleadventure.org/quark_confinement.html.

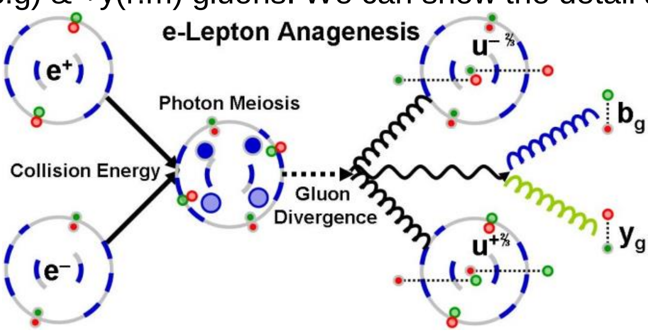
of quark-antiquark it should be color-other anti-color like red magenta (r+m). This has b-y bands such that at band snapping you get r+y and b+m gluons.

Meiosis—The creation of two or more new material identities generally of fewer change features. This would include photon emission from electron quantum leaping, and jet emissions.



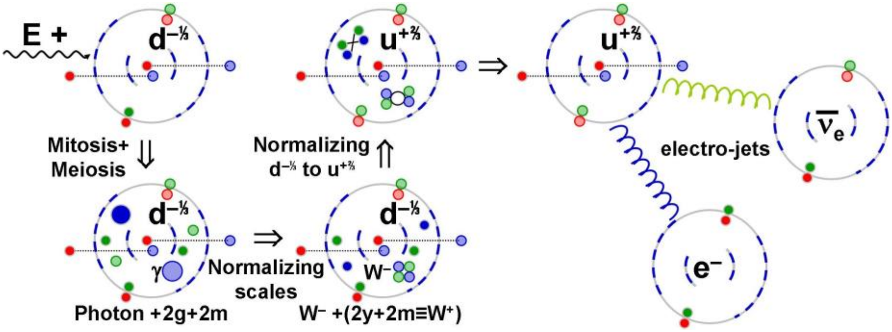
Thomson, M.A. (2004). Particle Physics. Cambridge University.

The meiosis image is described as a four jet system.[33] We classify it as anagenic meiosis because it is linear evolution involving the creation of b:y photons that diverge/differentiate into –b(c:g) & +y(r:m) gluons. We can show the detail as:



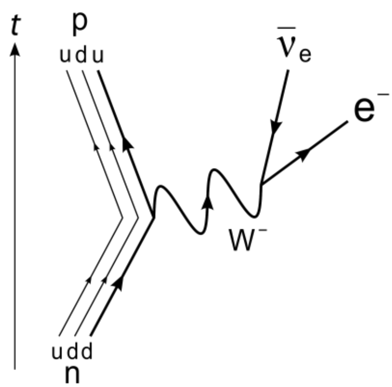
It shows vertical anagenesis of a charged e-lepton collision (pressure-volume), the energy appearing as a photon (virtual being a squiggly line). The result is a quark-antiquark pair plus two more gluon jets. Those gluons are created by means of photon meiosis. In confined spaces like a neutron, the jets can point into the host creating transition particles as shown in down decay. That decay switches a neutron to a proton.

[33] Thomson, M.A. (2004). Particle Physics. Cambridge University. hep.phy.cam.ac.uk/~thomson/particles/questions/Q16_answers.html.



This gives topological reasons why they emit conditionally as an antineutrino or positron. When they emit as a positron, they go through a +W phase instead of a –W phase.[34] Procedural pressures of a space (volume) confine energy to generate form, then convey adapting form into working optimization and result.

Color roles get swapped from mu (μ)=gb to electro (e)=rg to force escape as jets. The proton to neutron process emits muons[35] due to down quark's bº flavor. Feynman diagrams are handy for showing observations. These show why observations happen, giving the diagram predictive ability.



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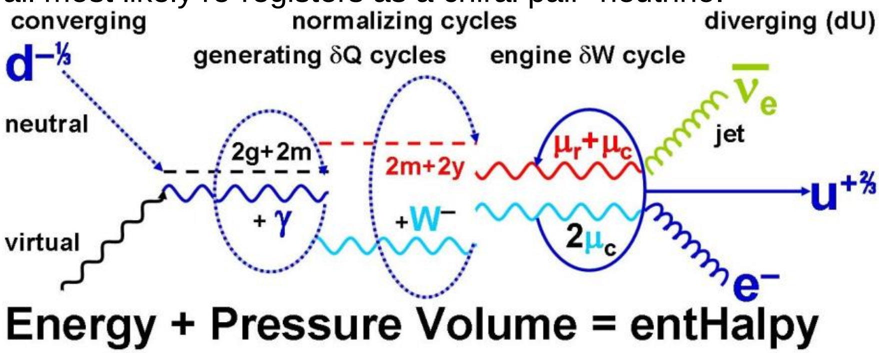
A Feynman version of this shows the quark confined in a hadron, and a common issue of which way to point the arrows.

[34] Irvine, J. (ret. Feb. 12, 2018). Particle Physics Tutorial 11 - Particle Interactions. antonine-education.co.uk/Pages/Physics_1/Particles/PP11/particles_ page_11.htm.
[35] Gorringe, T. & Fearing, H. (Jun. 18, 2002). Induced pseudoscalar coupling of the proton weak interaction. https://arxiv.org/pdf/nucl-th/0206039.pdf.
[36] Silverman, D. (Feb. 11, 2013). Weak Isospin and the Weakly Interacting Bosons (Force Particles). sites.uci.edu/energyobserver/2013/02/11/weak-isospin-and-the-weakly-interacting-bosons-force-particles/.

We can adapt a Feynman diagram-like form to show the enthalpy process (H=E+PV) in better detail. One thing the details in two dimensions do not easily show is that 2m+2y are asymmetric, interacting as synchronous like (m+y):(y+m). For the weak boson to be symmetric, the other must fail, and the fail most likely re-registers as a chiral pair=neutrino.



The jets occur because of quantum number violations (Pauli exclusion) and sticky color conditions. To escape they have to take the available b:y space they are strongly interacting with. Instead of quantum leaping to break this, they simply swap identities.

In transitional weak boson state, as these muons are, they are interchangeable with their electro-analogs (see pg. 112). That change results in spontaneous forced emission (jetting). The new electro-identities stick. If we reverse the W-boson role, the y^o antineutrino (having –½ chiral isospin) becomes b^o and the electron becomes a positron (y-bands).

Although not shown, the engine cycle loses a lot of energy in forging the Weyl fermions. That energy is contemporarily looked at as “fission.” The diagram shows it is actually a fusion process responsible. From an atomic perspective it is fission because a nuclear isotope breaks down in the process.[37]

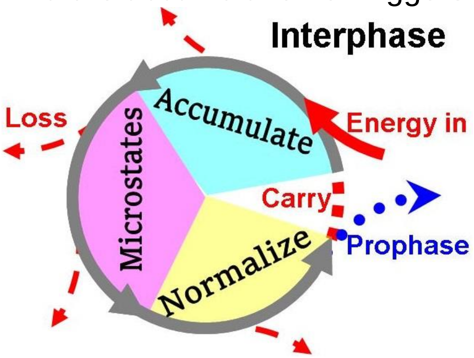
We tend to look at things in terms of our ways to dissect them. We see particles when we are smashing them into each other with intense added energy and pressure. Such violence is indeed commonplace, but so too is the passive version of these processes. The down decay diagrams are passive.

[37] (ret. Feb. 12, 2018). Nuclear Fission. https://www.nuclear-power.net/nuclear-power/fission/.

Interphase

In biology,[38] interphase is "the time between mitoses… During G1 (Gap 1), the cellular organelles and cytoplasm, including important proteins and other biomolecules, are duplicated. S (Synthesis) Phase is the point at which DNA is replicated. G2 (Gap 2) is spent double checking that no errors have been made during DNA replication."[39]

In physics, this sub-phase breakdown fits a phase (moment) energy cycle. Energy enters the system and accumulates with other excess energies. These energies pass through the extra-temporal microstates to metabolize. Metabolizing normalizes the information of intrinsic and transient energies. What hasn't escaped in the process compounds with future accumulation or triggers prophase.



Normalization is the observational perspective of smoothing. It is computed using Schrödinger's equations.[40] His wave normalization function was designed to evaluate a wave function (ψ) to compute the probability of finding a particle along a trajectory axis (x) in time (t).

[38] Riggio, G. (Jun. 2, 2017). 5 Stages of Mitosis. sciencing.com/5-stages-mitosis-13121.html. (Mitosis phase references continued at bottom of next page).
Grimes, B., & Hallick, R. (Oct. 2004). The Cell Cycle & Mitosis Tutorial. http://www.biology.arizona.edu/cell_bio/tutorials/cell_cycle/cells3.html.
(2018). Mitsosis and Meiosis. Khan Academy. khanacademy.org/test-prep/mcat/cells/cellular-division/a/mitosis-and-meiosis.
[39] Baker, R. (May 18, 2017). Stages of the Cell Cycle - Mitosis (Interphase and Prophase). https://owlcation.com/stem/Stages-of-the-Cell-Cycle-Mitosis-Part-1-of-2.
[40] Santra, S.B. (2013). Quantum Mechanics-Schrödinger Equation. iitg.ernet.in/santra/course_files/ph101/QM-02.pdf.
Fitzpatrick, R. (2010). Normalization of the Wavefunction. farside.ph.utexas.edu/teaching/qmech/Quantum/node34.html.
Nave, C.R. (2017). Particle in a Box. Georgia State University. http://hyperphysics.phy-astr.gsu.edu/hbase/quantum/pbox.html.

We are approaching from the opposite direction as if we are nature with all the answers. We aren't predicting. We are specifying by creating the wave cycle from the EMA-EMR information in the force energies. These smooth into the predictive normality.

Schrödinger Normalization of x in Wave (ψ) over time (t)

normalization of t in the wave over cycle (k)

$$\int_{-\infty}^{+\infty}\left|\psi\left(x, \int^{c}\left|\psi\left(t, \int_{0}^{2\pi} |\psi(k, f_k+\Delta f_x)|^2\, dk = |k_t^2| = +1\right)\right|^2 dt = 1\right)\right|^2 dx = 1$$

cycle normalization = oscillation

Schrödinger's probability density $|\psi(x,t)|^2$ is the observational frame in which force information differences sequentially oscillate and smooth relative to the duration (c) of time (t). Spacetime reference frame can be refined specifically because it is dependent on the central force oscillation.

Time resists microstate cycles and change of identity. Increments of time (δt) are defined by the period of cycle frequency (υ).[41] Cycle frequency increases directly to energy in the system per Planck's $E=h\upsilon$, so δt resistance decreases.

Energy is added to a system using relativistic momentum ($E^2=E_\square^2 + E_x^2$). This relationship leads some to incorrectly conflate virtual photon observation with real photons and momentum. The correct interpretation of the relationship between frequency and relativistic momentum is temporal dilation.[42] Energy is the time derivative of the kg m unit form of force (F) applied to a spacetime:

$$\mathbf{E= d\ cF/dt}$$

In each increment of time, energy can be added or removed from the system. In each increment of time, intrinsic and transient information goes through the microstate sequence and to a degree smoothes into one complementary sequence of information.

Generally speaking, the transient energy (f_x) is significantly less than the intrinsic energy ($f_\square$). They proportionally mirror each other. Proportional mirroring gives the transient energy

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[41] OpenStax College (2018). College Physics. Rice University. courses .lumenlearning.com/physics/chapter/16-2-period-and-frequency-in-oscillations/.

[42] Acosta, D. (2006). Relativity 4: Relativistic Momentum. University of Florida. http://www.phys.ufl.edu/~acosta/phy2061/lectures/Relativity4.pdf.

the identity of the interaction—the bands defined by attributed value like absorption bands from a reflection.[43] Even if the energy passes straight through, it passes during a microstate cycle, influences and is influenced.

Excessive application of force, as with acceleration, causes an excess in oscillation attempting to normalize the information. This and pressure preventing escape, lead to identity loss or transformation (ꝁ□→anagenesis). If we could have all the information, we could also identify exactly which identity oscillation applies at specific points in the timeline.

Eigenstates

Lower case psi (ψ) represents the complete wave function of an identity—the Schrödinger equation. The function is the cycle of all energy distribution sets (microstates). Each set consists of all the color change functions acting as containers defining the whole identity. Each change container is a distinct wave function commonly called an eigenstate (Ψ).[44]

Each eigenstate in each set has a scalar energy value ($\hat{E}$). This scalar acts like a Laplacian in that it contains the EMA-EMR information: $\hat{E}=\hat{A}+\hat{R}$. The sequential sum of these for the set is the Hamiltonian operator ($\hat{H}$).

Ordinarily we think of the scalar just giving the wave function magnitude. What we actually have is a feedback system. The wave function has a smoothed operational perspective. The energy information is anomaly applied to the wave function. If the anomaly is too extreme, it changes the wave function of identity.

Traditionally (below), $\hat{H}$ is broken down as the sum of kinetic and potential energies. Potential appears as a vector radial position in time=V(r,t). We can think of potential as the effect of extrinsic forces acting on position and motion.

$$\hat{H} = V(r,t) - \frac{\hbar^2 \nabla^2}{2m}$$

[43] Blair, W.P. (ret. Feb. 15, 2018). The Basics of Light. Johns Hopkins University. http://blair.pha.jhu.edu/spectroscopy/basics.html.
[44] Simons, B. (2009). Operator methods in quantum mechanics. U. of Cambridge. tcm.phy.cam.ac.uk/~bds10/aqp/lec3_compressed.pdf.
& … Handout Chapter 3. tcm.phy.cam.ac.uk/~bds10/aqp/handout_operator.pdf.

Kinetic energy appears as the absorption/intrinsic space defined by the Laplacian operator in a mass. The negative here resolves as generic ι^2, the change function diverging container value (m) into the Laplacian. This is like giving a bag value and shape by putting things in it.

Technically, all virtual particles have complex (imaginary) mass functions. For weak bosons this normalizes into ordinary mass. Through the conduct of eigenstate evaluations, the complex forms must be explored. This is especially true for computing confined mass from the quantum details.

That imaginary element affects the divergence pattern of ι^2. The divergence can be into a surface in or out of phase, volume, or a combination of these. Specific surface-volume combinations satisfy the GFE in the degree to which that eigenstate applies to the total wave function. Just as we overlay these maps in degrees to illustrate the fields, those same degrees affect the emerging mass value.

Relative Field Theory

Wheeler explained Einstein's gravity succinctly: "Spacetime tells matter how to move; matter tells spacetime how to curve."[1] Change functions are intrinsic to matter and define exactly how spacetime is shaped. Among these, the most fundamental is gravity: spacetime contracting into a linear pressure-order vector.

Such a broad definition invites an array of applications and causality. Disorder is required to establish order. The simpler your approach in one direction, the more complex it will be in others. This is why Thermodynamics applies broadly across Phase Mode. Its principles infest everything from greatest simplicity at the Möbiverse to extreme diversity of Use Mode.

By keeping our gravity definition simple, we have invited every linear contraction of spacetime to apply as a form of gravity. The focus of contraction need not have mass. It does not require the curvature of spacetime either. Like the strong interaction, gravity is not just one thing but a class of things.

We must also take notice of the word linear. There are curved forms as well. Both are regulated, distinguished and related to each other by permeability and permittivity. We make the distinction to allow the vector hierarchy to apply. The vector hierarchy allows Einstein's cause of gravity being spacetime curvature. It also allows spacetime curvature to be caused by gravity.

Quantum Gravity

By quantum gravity we do not mean the attempt to explain gravity in quantum terms.[2] In the sequence of matter, gravity as perfect enfolding order (singularity) is the first and ultimate field. Singularity of any size is a quantum number. For this reason, anything that can quantize into a fully occupied space (singularity) is fundamental and cannot renormalize.

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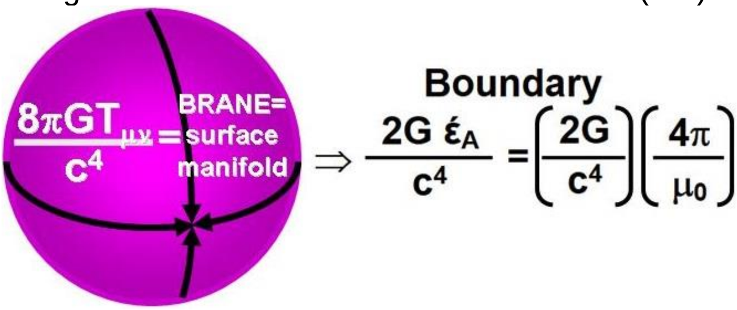
[1] Wheeler, J.A. & Ford, K. (1998). Geons, Black Holes, and Quantum Foam: A Life in Physics. NY: W.W. Norton & Company, Inc.
[2] Rovelli, C. (2008). Quantum Gravity. scholarpedia.org/article/Quantum_gravity.

The first instance of linear contraction establishing order is a primordial enfolding brane—a singularity surface tension with no depth. We will call this brane gravity, and its field equation the BFE. Einstein used the BFE to give value as stress energy curving spacetime causal of gravity.[3] Einstein makes regular use of branes as action containers (/m²).



The BFE is derivative of the Poisson-Gauss field equations (see pg. 17). Gauss's field (g=/s²) is a temporal container dilating a Laplacian distribution (D_e□=meters). D_e□ • g= 4πG ρ is the linear acceleration of gravity given value by mass density (ρ=mass/V) applied to linear permeation (G).[4]

Renormalizing

Renormalizing is the process of limiting an infinite into a finite frame or group.[5] Here, renormalizing is confining (losing the original identities of) potentially infinite quantum complications into relativistic unit frames (quanta). These units are simply additive and/or subtractive. It is like finding a common denominator.

The strong bond forming flavor volume and entanglement band pairs are forms of strong renormalization as their unit scales never change, but their arrangements do. The most obvious renormalizations are weak charge and hadronization of mass. Interactions of those classes thereafter are simply additive/subtractive.

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3 Johnston, W.R. (Nov. 3, 2008). Calculations on space-time curvature within the Earth and Sun. www.johnstonsarchive.net/relativity/stcurve.pdf.

4 Carroll, S.M. (Dec. 1997). Lecture Notes on General Relativity. UC Santa Barbara. https://arxiv.org/pdf/gr-qc/9712019.pdf.

5 Baez, J. (Dec. 9, 2009). Renormalization Made Easy. math.ucr.edu/home/baez/renormalization.html

Gravity cannot renormalize[6] unless you count quantizing in a change proportion to form a color charge. Other than that, linear and angular/EM forces are subject to permittivity and permeability. Fulfilling both requirements in a category **quantizes a spacetime**. A quantized spacetime is the perfect order of singularity.

Every field is subject to permittivity/permeability. Every field can be condensed, dilated, or filled to full occupancy. Interactions renormalize, but their fields do not. Their fields instead can quantize to form new matter or go the distance to singularity.

Poisson used scalar potential ($\phi=/ms^2$), setting g= –D_e□• ϕ. This gave D_e□$^2\bullet\phi=4\pi G\ \rho$, a complete Laplacian to distribute the acceleration of gravity.[7] GFE manifolds are distribution containers, making space the active component.

A straight-forward m^2 Laplacian is a distribution in 3-D space easily defining a spherical volume. The differential distribution is a temporally normalized change function containing the space.[8]

Gauss and Poisson saw time as the active agent: dilation acting on space. Einstein took the perspective of space being the container, its curvature the action.[9] Here, change shapes space into action on other spaces.

M□□ = ι(x□∂□ – x□∂□) symbolism is a Laplacian generator symmetry.[10] It coincides with our change function chirality (imperfect mirroring), such that μν is chiral of νμ. For us, μν = disorder:order = cyan. The difference affects the shape of local fields and details of strong interaction.

A brane has in and out of phase forms—seemingly a topological paradox. The out of phase form is imaginary until put into a more complex interaction. In phase, all points on the

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[6] Klauder, J.R. (Feb. 1975) "On the meaning of a non-renormalizable theory of gravitation." General Relativity and Gravitation. Vol. 6, Issue 1, pp 13–19. Springer.

[7] Brown, K. (2017). Poisson's Equation and the Universe. mathpages.com/home/kmath711/kmath711.htm.

[8] Grinfeld, P. (Feb. 12, 2017). What is the Laplacian? Philadelphia, PA: Drexel University & Lemma. Video at: https://www.youtube.com/watch?v=4J74tquQ7jU.

[9] Overduin, J. (Nov. 2007). Einstein's Spacetime. https://einstein.stanford.edu/SPACETIME/spacetime2.html.

[10] Di Francesco, P.; Mathieu, P; & Sénéchal, D. (1997). Conformal field theory. Graduate texts in contemporary physics. Springer.

surface are the origin acted on equally from all directions. This is like the elasticity of a balloon surface.

Just as a balloon without filling collapses into itself, a singularity of any magnitude enfolds out of existence without interaction. A singularity of any magnitude is order annihilating itself. At a primordial level the only thing it can annihilate is itself. Annihilation unfolds generally what is enfolded locally as exhibited by the function below provided earlier (see pg. 14).

mu at least = lesser m^2 in — Laplacian spacetime units — nu radial changes

$$\upsilon_\gamma = \frac{1-\eta}{h}\left(\mu_{n-1} = \frac{m_{n-1}{}^2}{\nu_n}\right)\left(\frac{\nabla^2}{t^2} = 2\pi c^2\left(\frac{\delta\frac{1}{2}R}{r} + \frac{\delta r}{\frac{1}{2}R}\right)\right)$$

upper magnitude singularity — $\int$=Surface in Volume — $\oint$=V in S

thermodynamic efficiency $$\eta = \frac{\delta W = PdV}{\delta Q = TdS}$$ Ejected light & evolving matter / Energy of mass into singularity

Unlike a black hole, a primordial cannot “feed” off of other matter. A primordial enfolds light locally and unfolds in the adjacent space as a wave function. Without restrictions added to that space, you simply have a propagating wave function.

A singularity has two input-output modes: local and general. To retain the identity of a singularity, both of these modes have to work together. The local mode draws in value locally and emits value that cycles locally. The general mode strongly interacts with value and distributes generally.

In the absence of local I/O mode, the strong interaction is with its own value. Instead of unfolding generally, it emits “locally” but without restriction of local cycling. The local cycle is an electromagnetic function dependent on mu-interaction. For a singularity to form and continue its existence at any magnitude, it must maintain enough interaction to maintain this electromagnetic field.

Einstein could only see the enfolding. He could not see it working together with unfolding. As a consequence, Einstein’s gravitational singularity enfolds impossibly to infinite.[11] It is also why he concluded that gravity is caused by spacetime curvature—the enfolding of everything else into that space being gravity. He could not imagine multiple gravities at work.

[11] Claes Uggla (Oct. 17, 2017). Spacetime Singularities. einstein-online.info/spotlights/singularities/index.html@searchterm=None.html

GFE Fields

Einstein's geodesic field equation (GFE) consists of interacting rectilinear surfaces.[12] If we were to migrate 4π from the BFE curvature to the GFE side, these surfaces become spherical. Rectilinear is a quality of the Laplacian.[13] Each of the GFE manifolds is a Laplacian generator, which confuses things. What matters is gravity emerges from the interaction of two surfaces that confine (conceal) their origins.

The problem with Einstein's GFE is common in physics: ambiguity. It is incredibly easy to get lost in so many ambiguities. One of the ambiguities is the issue of volume. By acknowledging the brane quality of these manifolds, we do not exclude the volume, we just confine it. The content of the volume becomes irrelevant.

By confining the volume, we now see the GFE consists of interacting surfaces ($/m^2$)—a Riemannian is "made up of an infinite of Euclidean spaces.".[14] The linear values derived from these surfaces are radii of order (o) and disorder (a= attributed). The geodesic function is gravity attempting to quantize into the perfect order of singularity.

Quantizing requires differentiating EMR as + and EMA as – values into the ± distribution of the J -entropy. It also requires either equalizing them or satisfying another boundary condition. Equalizing them zeroes the GFE out. What remains is the enfolding effect of $r\sqrt{2}$ displacement. The GFE manifolds can be made semi-conventional to illustrate this.

Without forgetting their origins, we can reduce each segment of Einstein's GFE to a radius by taking its numeric square root as shown below. Those radii translate perfectly into ordinary spherical topology to show what part is confined, what part is loose with directional surface, what exactly is being displaced, microgravity and continuity into generalized gravity with no upper boundary.

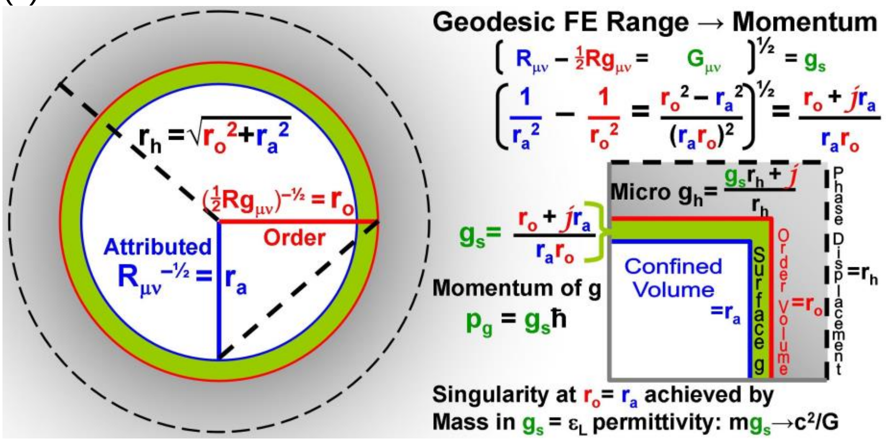
This breakdown is a lot easier to convert into other applications like momentum. We can relate this to distribution

[12] Hitchin, N.J. (1974) Compact Four-Dimenstional Einstein Manifolds. projecteuclid.org/download/pdf_1/euclid.jdg/1214432419.

[13] Holloway, R. (Nov. 7, 1999). The Laplacian in different coordinate systems. personal.rhul.ac.uk/uhap/027/PH2130/PH2130_files/laplacian.pdf.

[14] Besse, R.L. (2000). Einstein Manifolds. Berlin, Germany: Springer-Verlag.

(g□$^{-1}$=D_e□), from there to Gauss and the acceleration of gravity: g/g□= 4πG ρ (noting dilation=g=/s² and mass density=ρ). For the sake of radial symbolic consistency we can say r□≡g□$^{-1}$ to reflect influence of confined change variables (k).



We can also link it directly with linear permittivity (a Schwarzschild ε(L)=c²/G). Permittivity is typically used in electrodynamics to indicate "the capability of the vacuum to permit electric field lines."[15] Generically, permittivity is the capacity of space to receive value. It shows we can fill this space with mass (m • g□) to permittivity.

There are two immediately obvious paths to singularity: mass accumulation and equality of ordered and attributed values. The energy of momentum (E=g□ħc→mc²≡hυ) opens the GFE to the full range of applications and permittivity quantizations. Hiding in the midst of this are two more major fields, only one of which is properly a function of gravity.

There are two degrees of microgravity. The first degree is a localized effect of the electroweak field. The second is the continuation of that as an open-ended long-wave. Microgravity and the Fermi surface are tricky and require us to resolve the electroweak field first.

The Electroweak Field

The weak interaction is a set of conditions enabling flavor change (charge-parity/CP violation). It derives from Fermi's

[15] Serway, R.A. (2017). College Physics. Vol. 2. 9 ed. Content Technologies.

theory for contact particle exchange responsible for radioactive decay and subsequent atomic fission.[16] The phenomenon divides into: mediation particles and the field space defining or otherwise modulating the interaction.

The 1979 Nobel Prize was awarded to Sheldon Glashow, Abdus Salam, and Steven Weinberg for linking the weak interaction to electromagnetism.[17] Electromagnetic fields are hypercomplex—order-disorder change function interactions.

$$w\square\square = \iota(r\square\partial\square - r\square\partial\square) = s^2/m^2$$

The spacetime potential for weak interaction ($w\square\square$) is a temporal Lorentz group. The group is generated from radial phase space ($r\square^2=r_a^2+r_o^2$) difference squeezed (dilated) into the attributed value sub-spacetime ($r\square= g\square^{-1}=D_e\square$). The respective confined change elements (h,k) interact to define time (s^2).

The confined volume of (r_a) is space excluded from the group. Its confined change function relates to the general container ($\jmath_a = /\jmath_o$) we expect. Temporal emergence is seen here in the renormalization of weak charge.

The weak charge sign is set by $\iota/\jmath_o = \iota\jmath_a = \pm \rightarrow s^2$ that otherwise washes out in the equivalent s^2. Temporal abstraction isolates the charge unit to relative scale, like we used with microstates. Weak bosons and leptons contain the same degree of scale (e.g. parts and interactions). They set the normalized unit reference.

Charge from this point simply adds and subtracts—just as strong interactions affect mass up to hadrons, then they simply accumulate additively. A Weyl fermion as a strong volume is a magnitude greater than gluons and photons. None of these has a weak charge by itself though. Put into a weak context, Weyl fermions get ⅓ where gluons and photons get ⅙ charge equivalences.

This charge is temporal (renormalized) and sets the aspect perspective. It doesn't redefine the band identities, but it does affect the orientation of matter created in those bands. In

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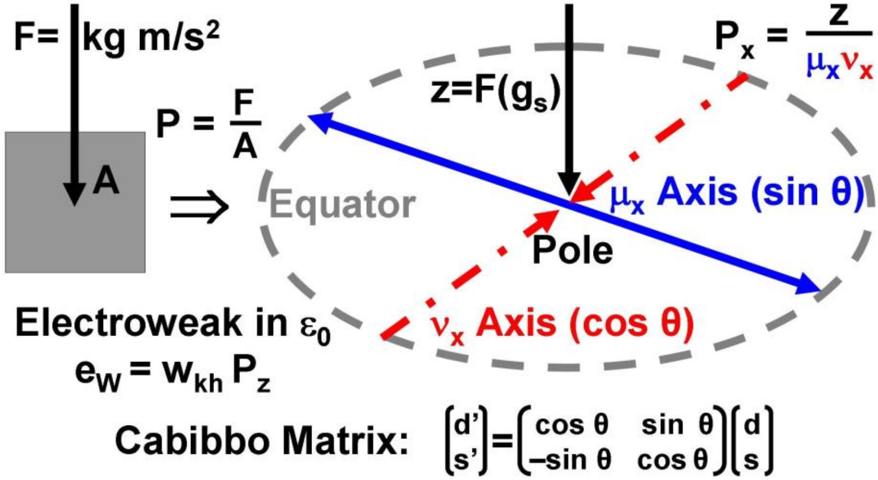
[16] Wilson, Fred L. (December 1968). "Fermi's Theory of Beta Decay". American Journal of Physics. 36 (12): 1150–1160.
[17] The Nobel Prize in Physics 1979. Nobel Media AB 2014. nobelprize.org/nobel_prizes/physics/laureates/1979/.

electroweak theory this is the “weak mixing angle” applied to Cabibbo’s matrix to compute spontaneous symmetry breaking.[18] This accounts for complex angles flat diagrams cannot show, like why an antineutrino (chiral isospin) occurs in down decay.



The density of this space is its “force.” That density contains intrinsic ($\nu_x = \jmath mG/c$) and transient qualities (e.g. heat). The intrinsic value can be described as linear (x) mass value. It is an elevation-related horizontal mass density.

Like heat, this is of a lesser magnitude than the force of gravity. Heat density is also fairly simple mathematically ($\mu_x = \iota Tkc/\hbar$). We find using standard kg m s units best for purposes of compatibility and reducing confusion. Boltzmann’s constant (k=1.38064852 x 10^{-23}-23 kg m^2/s^2K)[19] converts heat in Kelvin to kg m s units.

The imaginary elements are added to show time emerging in $\iota\jmath = s^2$. This is particularly significant to Fermi surfaces and the effects of super-cooling on friction, conductance, etc. Reducing heat also reduces the temporal resistivity of this space. It becomes less resistant to ι-entropy (e.g. disorder and electrical current).

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[18] Cvavb, C.R. (June 2000). Is the Cabibbo Angle a Function of the Weinberg Mixing Parameter? International Journal of Theoretical Physics, Vol. 39, Issue 6.

[19] (ret. Feb. 22, 2018). Boltzmann Constant: k. https://physics.nist.gov/cgi-bin/cuu/Value?k.

The imaginary elements are also relevant to the fact that you can't just convert everything willy-nilly to basic SI units (kg m s). There are consequences, you just need to understand which axes rotate and how. These complex forms are made real by confining context.

Naturally these densities focus more intensely than gravity alone. The strength of the weak interaction is 10^{-6} that of the ordinary strong interaction.[20] Coupling constants are used to describe the strength of interactions. A coupling constant of g<1 is considered weak. Fermi's is computed using muon life and W-boson mass: $G(F)/(\hbar c)^3 = 1.1663787 \times 10^{-5}\ /GeV^2$.[21]

The electroweak spacetime (w□□ = s^2/m^2) is a directional density potential. Populated with substance, the substance interacts with itself as an area $A=\mu_x\nu_x$ defined by heat (μ_x) and order (ν_x) axes. While circular, we tend to look at these as rectilinear (x). These provide the sine and cosine quadrant applications in the Cabibbo matrix.

The force of gravity (shown as the z-axis) put into this area defines the actualized system pressure (P_x). Applying this pressure to the electroweak spacetime potential provides a degree ($U \leq 1$) of electromagnetic permittivity ($U\varepsilon_0$ =w□□P_x) as the electroweak vector field value. At U=1, the electroweak field quantizes into singularity.

<u>MicroG & Fermi Surface</u>

The electroweak field fluctuates with change in heat and content. The charge sign is native identity predisposition toward balance: + @ $\nu_x > \mu_x$, 0 @ $\nu_x = \mu_x$, – @ $\nu_x < \mu_x$. Ideally you want a perfect balance that can manage imbalance without losing identity. Too positive and it enfolds out of existence. Too negative and it unfolds out of existent. Too neutral and it triggers either way with little provocation.

This is essentially why the universe is dominated by atoms. Atoms keep their electron disorder fields on the outside held in tight conformity by the weak charge interaction with a proton. Energy changes affect how tightly packed these relationships

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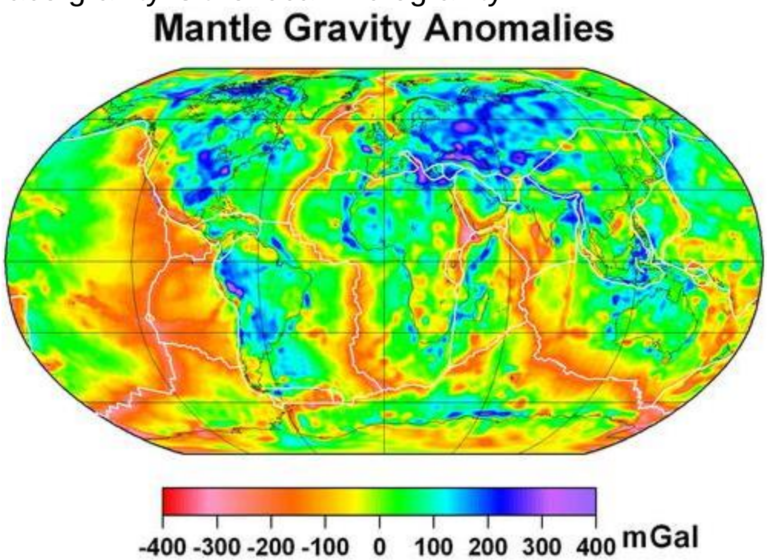
[20] Nave, C.R. (2017). <u>Fundamental Force</u>. Georgia State University. hyperphysics .phy-astr.gsu.edu/hbase/Forces/funfor.html.

[21] (June 2015). "Fermi coupling constant." <u>The NIST Reference on Constants, Units, and Uncertainty</u>. https://physics.nist.gov/cgi-bin/cuu/Value?gf.

are. New electron orbit groups compact existing orbit groups, and new members to a group enlarge the group size.

When the group can't expand or contract due to structure and pressure conditions, new qualities become evident. One of these is the creation of a space called a Fermi surface. The most notable Fermi surface applications in material science are viscosity, phase states (solid, liquid, gas) and resistivity in electrodynamics.[22]

Generally we think of the electroweak field being the charge definition within the region of surface gravity. It is bigger than that region. What extends beyond the realm of surface gravity is the local microgravity.



[23]

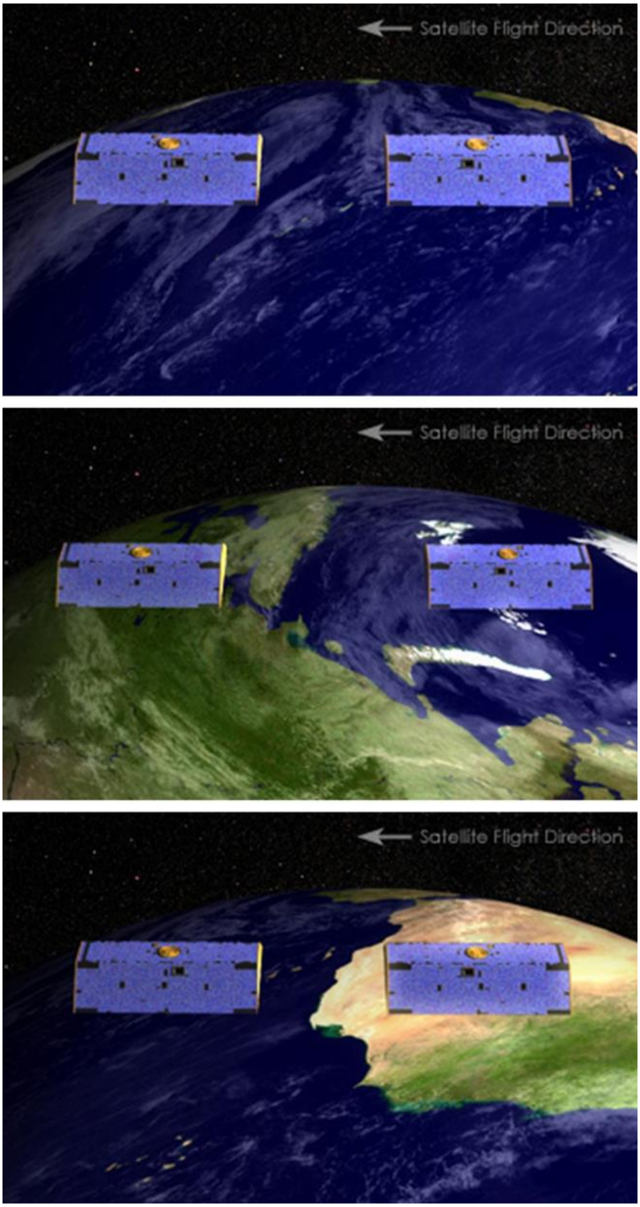
Most of this is horizontal fluctuations of substantive order (ν_x) and heat disorder (μ_x). This fluctuation is measured by the GRACE satellites and mapped as the anomaly of gravity (above). The pressure of the electroweak field affects the rate of local surface gravity intensity—specific weight. The surface of the mantle is the confinement surface. Take away everything else and surface gravity is constant.

[22] Dugdale, S.B. (Apr. 18, 2016). Life on the edge: a beginner's guide to the Fermi surface. The Royal Swedish Academy of Sciences. iopscience.iop.org/article/10.1088/0031-8949/91/5/053009/pdf.

[23] Reigber, C. (Jan 20, 2004). First GFZ GRACE gravity field model EIGEN-GRACE01S released on July 25, 2003. op.gfz-potsdam.de/grace/results/grav/g001_eigen-grace01s.html.

GRACE is a pair of NASA satellites connected to each other. They orbit at 220 km (137 miles). The distance between them is a measure of horizontal field differences resulting from density variations. The lead satellite is slowed by increased density causing the distance to contract, and then accelerates by decreased density causing distance to expand. [24]

[24] Ward, A. (Mar. 30, 2004). Gravity Recovery and Climate Experience (GRACE): “The Workings of GRACE.” https://earthobservatory.nasa.gov/Features/GRACE/.



GRACE is an accurate reflection of the anomaly of gravity due to smoothing. Beyond the range of surface gravity, z in the electroweak field is defined by phase displacement—the generalized gravity by which the rest of the universe interacts with us. The local heat conditions (weather) no longer apply. All that applies is the crust thickness and density.

This anomaly shows changes in the ordered brane from which disorder is subtracted to define surface gravity. This subtlety is like being subjected to an error function while in orbit. Generalized gravity from phase displacement has no direction without interaction. The region of microgravity provides degrees of incidental interaction—horizontally. You can orbit in this region, but the anomaly will act as friction eventually causing orbital decay.

Electromagnetism

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—, 1934
source

Confined Morphology

Virtual matter provides focal values whose interactions construct confined spacetimes through the process of hadronization. Once matter is functionally confined, it becomes subject to a new range of topological constructions and interactions.

In this chapter we will examine the root of structure formation, the resulting topologies, and interactions defining the complex field behaviors of confined matter. This includes such topics as nuclear structure, magnetic induction, electron orbits and the limits of atomic scale. We then advance into the quantized momentum and vector systems that shape the cosmos.

Trionic Bonds

A lattice cell is the interaction and arrangement of discrete points into a regular geometry.[1] A nuclide is the set of protons and neutrons defining a nuclear isotope.[2] A nuclide lattice is thus the specific arrangement of protons and neutrons. The rules of arrangement show emergent physical properties like magnetic induction, susceptibilities, and isotope limitations.

Nuclear structure is typically depicted as a random mix of nucleons in a ball shape. The assumption is that nucleon interactions are quantum, so it doesn't matter. Nearly everything quantum in nucleons has renormalized. Spacetime specifically has been renormalized such that further interactions are no longer defining space from scratch, but rather defining points in space.

The only quantum components not entirely confined are the trionic band edges and surfaces used to strongly interact with other nucleons. These bands and resulting strong interactions (type VI see 115) are subject to uncertainty including microstates and color changes. Those uncertainties

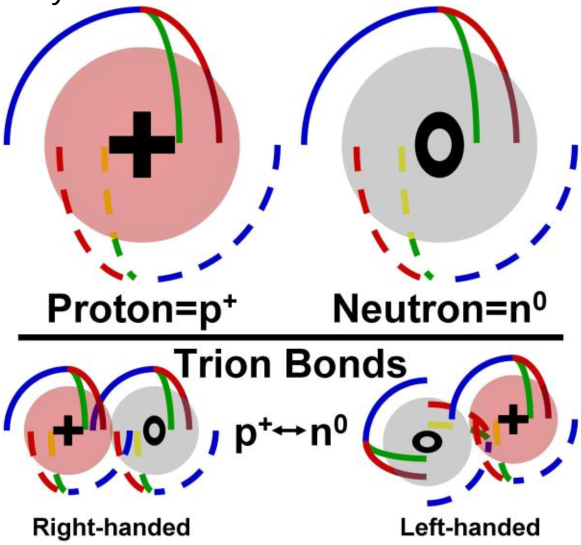
[1] Gross, R. & Marx, A. (2014). Solid State Physics (Festkörperphysik). Berlin: De Gruyter Studium. German language.
[2] Chieh, C. (Jan. 21, 2004). Nuclides. University of Waterloo. science.uwaterloo.ca/~cchieh/cact/nuctek/nuclide.html

enable renormalized qualities like weak charge, but do not violate them.

The rules of type VI strong interaction are regulated by the color configurations of trion geometry. Let us simplify terminology and call this the trion interaction. The original strong bond formed flavor volumes and could occur in pairs (rg|cm, gb|my) or triplets (rgb|cmy).

Through the stages of development, triplets became the stable preference for space-sharing strong bonding. Confinement has also created an unusual band condition. These define edges and between the edges is a band surface. For example, between r & g bands is a y surface. Leptons also have surfaces like this, but their context renormalizes that surface into temporal.

Band edges surfaces are attributed spaces. As a consequence, the space of this interaction is both electroweak and strong. The electroweak role is generally restricted to charge, though energy changes can evolve that to nuclear reactions affecting trion bonds. Each trion bond is actually a double bond between a two band opposite edges and their complementary band surfaces.



The right-handed bond joins the two in a common ȷ-spin direction. The left-handed bond causes the sinusoidal s-shape of disorder (ı). Left-handed reveals how these bands function. In the sequence of microstates, bands become real while the main identity parts become null. Without this actualization of value, there is no interaction.

With actualization of band values, the left-handed bond risks breaking. Energy changes affect cycle frequency. While frequency for an edge remains in the range of the surface it bonds with, it is okay. However, the left handed configuration is making the life of the neutron more complicated. It is made vulnerable to down decay and the consequent chain of nuclear decay.

Each trionic bond uses up one band and one surface for each member's trionic geometry. That geometry allows for only three bonds of this nature. As a renormalized interaction, the trionic bond is also subject to ordinary energy distribution.

In microstate evaluations we smoothed quantum numbers by rounding e up to 3 (pg. 76 et seq.). Here we can't round it due to all the renormalization. It is no longer just a quantum number to smooth. It is an ordinary real value we cannot ignore or renormalize because it is defining a boundary condition. Without this boundary, nuclides would not need structure.

Structure Groups

Structure is a classical concept we can all relate to easily. Structures are vital to functionality. Nuclide structures are classical solid geometry concepts that are held together by quantum elements that are confined in the process (renormalized). A regular geometry optimizes the energy use of the parts.

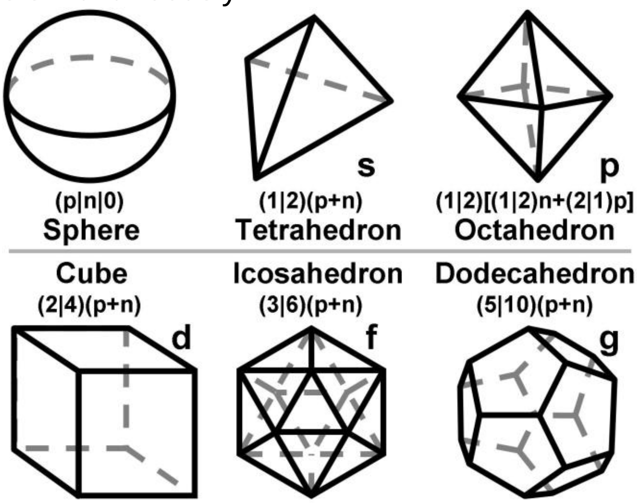
In engineering, spheres are ideal structures followed by triangles and squares.[3] Regular/Platonic solids are generally considered to be Euler's with 4, 6, 8, 12, and 20 faces. The sphere is also a regular solid, except it represents the quantum concept of a point-surface. In mathematics, points

[3] Chinnis, D. et al. (2013). Exploring Structural Engineering Fundamentals. teachengineering.org/content/cub_/lessons/cub_trusses/cub_trusses_lesson01_presentation_v5_tedl_dwc.pdf.
Fyon, A. & Ginn, E. (1999). Professor Beaker's Everyday Structures and Systems. steps.ie/StepsToEngineering/media/StepsToEngineering-medialibrary/Volunteers/Activities/Everyday-structures-and-systems.pdf.

are generally brushed under the rug by assigning an infinite points to a line, line/edges enclose surfaces enclose volumes.

Pentagons aren't remarkably sturdy, but in a icosahedron they form an approximation of a sphere. This is the one regular solid you cannot connect with a continuous non-crossing line. If there were such a thing as a g-orbit for an electron, it would attempt to follow this shape and fail. The dodecahedron is a near approximation of a sphere with triangles.

We will assume generally that hyper-hedrons are the exception rather than the rule. Nucleons thus describe vertices of polyhedrons, their trion bonds defining edges. Thanks to microstate energy exchanges, they don't need to provide all the edges simultaneously.



These are in order of vertices, which roughly coincides with ideal structure sequence. Baez provides hyper-hedron[4] illustrations that are very stable because they build up with triangular structures. Nuclides can certainly structure themselves this way too, but at significant cost. It would dramatically affect the emergent fields and create other complications, but a worthy pursuit to explore.

Due to renormalizing in structure, energy can be treated as distributed in equilibrium across those edges as if they were simultaneous. Things get a little trickier when the nucleon

[4] Baez, J. (Nov. 12, 2006). Platonic Solids in All Dimensions. math.ucr.edu/home/baez/platonic.html.

structures form layers of nuclide shells. Each solid describes a symmetric or asymmetric nuclide. The asymmetric nuclide would consist of half the points of its symmetric cousin.

Ordinarily we may assume that an asymmetric must be set upon a symmetric and that they would occur in the order of sequence stability. They definitely occur in order of sequence stability, but not necessarily by symmetry or handedness. For example, a lone or randomly injected left-handed would be considered unstable. As part of a nuclide core, however, left-handedness is the expectation.

Each of these is shown with possible architecture contents and assigned an orbit-compatible sign (b, s, p, d, f, g). A lone neutron in the core could be shown as $_0$ b□. A proton+neutron pair as $_1$ s_1 . A p-shell can be single right or left-handed (l=2n+1p→ $_1$ p_1 □) or a double ($_1$ p_2).

Nuclide shells consist of unlike parts, so they will configure differently. Assuming one neutron per proton, He – B fill $_0$ p - $_0$ g respectively. The spatial requirements, however, limit the number of core components in a complex to 0, 1, and 2 protons—up to $_0$ p_1 . If there is a proton core, it must be H (1=$_0$ b,2=$_0$ s_1 , or 3=$_0$ p_1 □) or He (3=$_0$ p_1 or 4=$_0$ s_2). The iron structure illustrated below (see pg. 153) could be written:

nuclide = 52 Fe
protons = 26

Nuclide Structure:
$_0b_0+_1g_2+_2f_2+_3g_2$

Except that nuclear density is constant at ρ□=3N□/4πr³ (nuclide mass per spherical volume)[5] The spherical radian 1/2π≡s², makes nuclear density a function of the Schwarzschild radius—the linear permittivity of spacetime. This leaves only a tricky U=/m² surface function to work out.

ρ□=Uc²/2G=2.34378270633671×10¹⁷Ukg/m

Permittivity suggests singularity except for the issues of U, neutrons, and structural behaviors. U conveniently provides means to inject disorder energy as U=(cħ/δQ)².

U=2π [w□□ = ι(r□∂□ – r□∂□)] = /m²

ρ□ = [2πw□□] [c²/2G]

[5] Nave, R. (2017). Nuclear Size and Density. University of Georgia. http://hyperphysics.phy-astr.gsu.edu/hbase/Nuclear/nucuni.html#c4.
(2018). The Atomic Nucleus. cyberphysics.co.uk/topics/atomic/nucleus.htm.

The electroweak spacetime gets renormalized into the ordered nuclide density. This enfolds the structure with a distribution of disorder into a complex function.

QM Aspects

There are several approaches to nuclide structure. When one problem produces a whole class of working solutions, one must conclude the problem itself is a contextual complex to be analyzed in quantum terms. Elements of multiple approaches hold simultaneously true. Watkins lists several:[6]

Liquid/quantum drop model—a Gamow idea enhanced by Bohr-Wheeler to describe the nucleus as a smooth but fluid consistency (like a water drop). Their nucleus would be confined, contiguous, and non-compressible.[7]

Shell models—tend to either follow electron orbit-like shapes or get quantum renormalized away from those shapes.[8] Quantum is good for playing both.

Model of Independent Particles—treats the nucleus as an n-body problem, which fits certain quantum contexts.

Substructure/Cluster model—n-body problem contextually forms m-groups, again fitting quantum contexts.

Collective model—shape arises from collective motion, which is true except it is quantum motion so the shape is simultaneously defined.

Fluctuating Combinations model—fluctuation among all possible combinations.

Interacting Boson model—is among the most relevant and shell-related;[9] the electroweak spacetime component paths to magnetic susceptibility, induction, and degeneration.

Alpha Module model—Uses alpha particles (α=2p+2n) to compress/compact lattice/structure points. With heavier

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[6] Watkins, T. (ret. Feb 25, 2018). Models of Nuclear Structure. San Jose State University. http://www.applet-magic.com/nuclearstruct.htm.

[7] Shupe, C. (2015). Nuclear models: The liquid drop model Fermi-Gas Model. http://atlas.physics.arizona.edu/~shupe/Indep_Studies_2015/Notes_Goethe_Univ/A2_Nuclear_Models_LiqDrop_FermiGas.pdf.

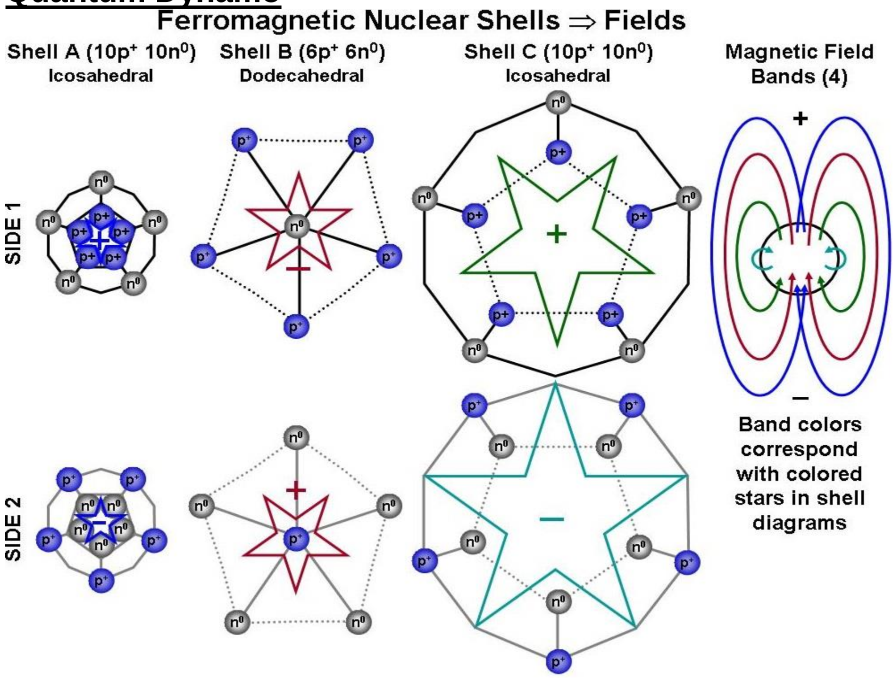
[8] Dayou, C. (Feb. 6, 2018). Statistical Model of Nuclide Shell Structure. NW University, China. medcraveonline.com/PAIJ/PAIJ-02-00050.pdf.

[9] Elliot, J.P. (1985). The interacting boson model of nuclear structure. iopscience.iop.org/article/10.1088/0034-4885/48/2/001.
Cejnar, P. & Jolie, J. (July 22, 2008). Quantum phase transitions in the interacting boson model. https://arxiv.org/pdf/0807.3467.pdf.

elements this is an extremely likely way to evolve the structuring to handle the massive numbers.

We omitted Lattice/Monte Carlo as a method of exhaustive computational experimentation. These all contain valid elements or concepts.

Quantum Dynamo



Nuclide structure is a quantum phenomenon renormalizing mass density. A lot of features are confined (hidden) in the process. Confinement also means we cannot think of our shell structures classically. They emulate classical mechanics, but in a quantum way—hence quantum mechanics.

As QM, we can go through all our conventional mechanical thinking and computations. We absolutely cannot forget that these measurements are applied to an imaginary axis in the system. This QM system can form a dynamo effect in degrees or perfectly (e.g. ferromagnetism).

Let us assume energy acting on a nuclide affects the entire structure together. This means energy going in or out of the system is treated as acting uniformly in time across the system. Aside from proportional distribution of energy, it will be as if the other groups aren't there.

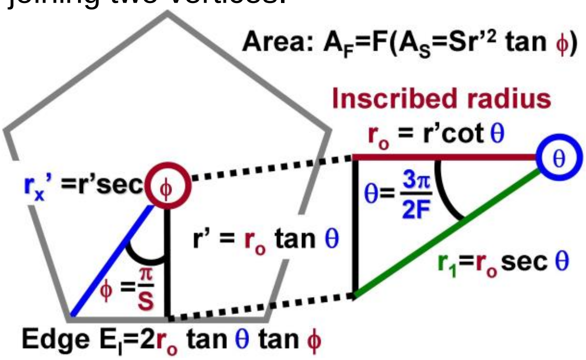
Energy gets divided between angular rotation and linear expansion at contextual convenience. These act on the system as surface containers/manifolds: $U=(c\hbar/\delta Q)^2 \rightarrow 2\pi w$□□. The electroweak spacetime (w□□ see pg. 138) consists of both intrinsic and transient (heat) values.

Our QM system undergoes an imaginary linear surface expansion. It is imaginary in that the change function is sub-temporal. If it were temporal, it could not function in this already occupied space.

		F	V=FS/J	E=F+V–2	S=2E/F	J=2E/V
Trionic Point*	–	1	2	1	2	1
Tetrahedron	s	4	4	6	3	3
Octahedron	p	8	6	12	3	4
Cube	d	6	8	12	4	3
Icosahedron	f	20	12	30	3	5
Dodecahedron	g	12	30	20	5	3

*renormalization of color charge shaping to spherical point.

Mensuration formulas for regular solids utilize Euler's and related variables. S=sides per face is easily computed by dividing F/360 then find the median of the listing of all the 3s, 4s, and 5s; or S=2E/F. J=number of edges joining a vertice, each edge joining two vertices.



Polyhedron evaluations renormalize into spheres but are enormously helpful in QM. Our focus is total area=A(F)=A. Each structure group/shell has its own proportion of the electroweak spacetime (manifold) of the whole: $U_a=U\ A/\sum A$□.

While treated as polyhedrons relative to each other (e.g. squeezing r_x of one into r_o of another), linear expansion is smoothed in time to angular. Squeezing consists of increasing the areas proportionally together until one can fit inside the other. Rescaling takes energy that could be magnetic force—inefficiency in the system. Radial ratios show p goes easily into d and f into g.

$$\frac{\text{Exscribed}}{\text{Inscribed}} \quad \frac{r_x}{r_o} = \sqrt{\tan^2 \frac{3\pi}{2F} \sec^2 \frac{\pi}{S}}$$

Tetrahedron	**s**	**4.930 893 275 967 83**
Octahedron	**p**	**1.669 086 806 815 86**
Cube	**d**	**1.732 050 807 568 88**
Icosahedron	**f**	**1.109 302 142 000 00**
Dodecahedron	**g**	**1.123 450 055 497 63**

The dynamo-effect is a geophysics theory in which spinning interactions of the core generate magnetic field lines. In contemporary thought, ferromagnetic elements with weak magnetic fields excite electrons in the convection currents of the mantle and core.[10] This is based on inducing electrical current by rotating a coil in and out of magnetic fields.[11]

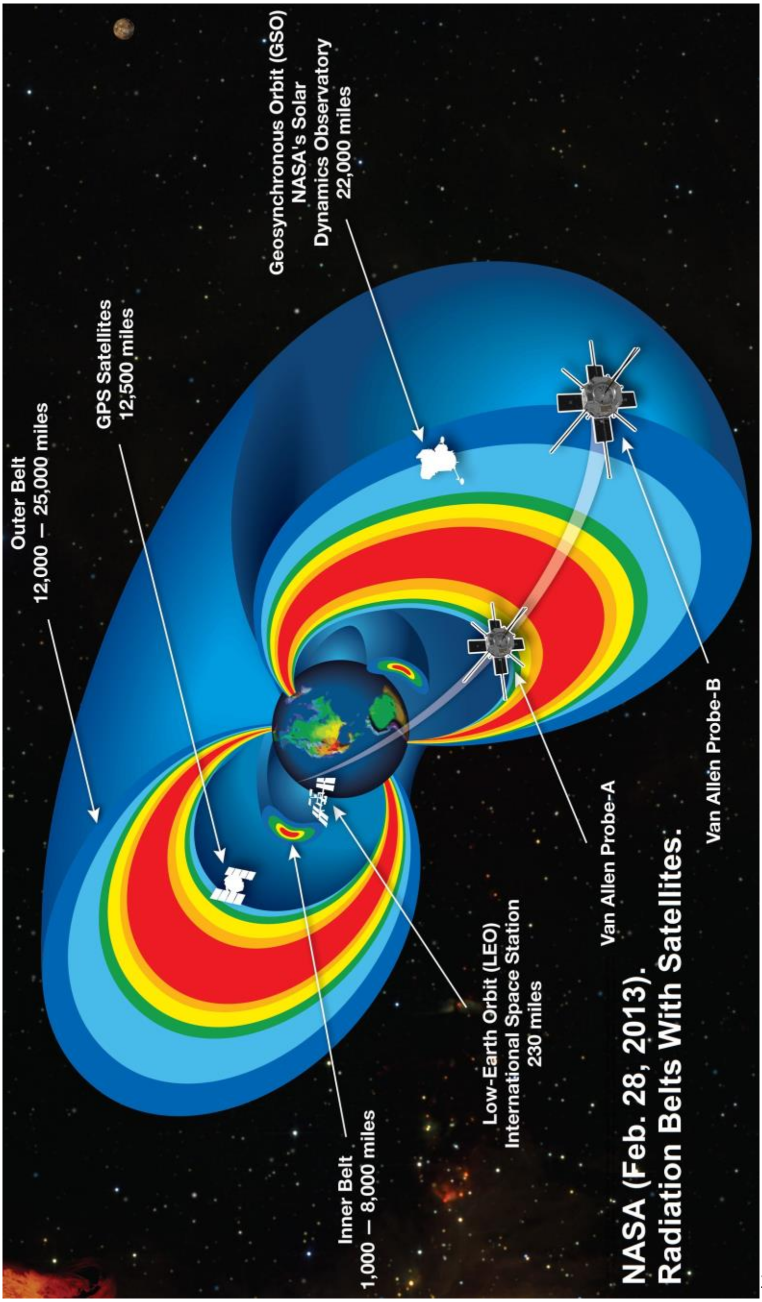
Electromagnetism covers a very large group of cross-phase interactions—namely interactions between order and disorder on quantum change levels. The result is bi-directional quasi-temporal fields consistent with ɦ-entropy (phase).

Electrons and electrical current can certainly play a role, but are not the actual source of magnetism. The source of magnetism is transient weak charge interactions. The transience of these interactions is extra-temporal and occurs in the imaginary electroweak space of the nucleus.

The neutral charge in passing through the same electroweak space as the positive charge, conveys the expansion of both into a projected angular field. Recall the permittivity and permeability table (pg. 52). Angular and electromagnetic constants are inversely related: $4\pi\varepsilon_a=\varepsilon_0^{-1}$.

The linear expansion in time becomes angular. Angular force is object contained (m^3/kg). Neutralizing charge passing through that electroweak space swaps from object to volume oriented (kg/m^3).

[10] Guzman, R. (Oct. 15, 1997). Dynamo Effect. astro.ufl.edu/~guzman/ast7939/glossary/dynamo_effect.html.
Bettex, M. (Mar. 25, 2010). Explained: Dynamo Theory. news.mit.edu/2010/explained-dynamo-0325.
[11] Tilgner, A. (Apr. 2, 2012). The Twists and Turns of the Dynamo Effect. https://physics.aps.org/articles/v5/40.



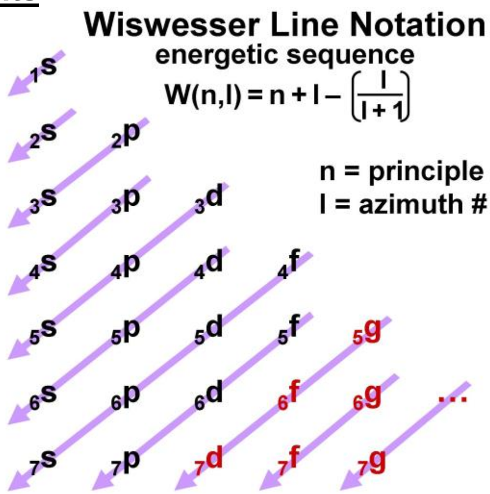
[12]

[12] (Feb. 28, 2013). Radiation Belts with Satellites. nasa.gov/mission_pages/sunearth/news/gallery/20130228-radiationbelts.html.

The energy of magnetism is the energy in the electroweak spacetime. This includes intrinsic values from trion bonds, extra charge values,[13] and transient energies, like the force of electrical current in the solenoid of a bar magnet.[14]

Earth's magnetic field (above) is most likely a product of weakly interacting (super) massive (degenerate) particles excited by the active core and even more complex field conditions. To study electromagnetism we need to account for both intrinsic and environmental influences.

Electron Orbits



Atoms complete what to us would be the renormalization process. The components going into an atom are not alone completely renormalized. Wiswesser's system for electron energy sequence (above)[15] is our renormalized perspective. It groups electrons according to Bohr's model (n=principle quantum number/energy level) and orbital angular momentum (l=azimuth quantum number=0→3).

These quantum numbers are integers whose units are renormalization—confined quantum variables. Electron orbits

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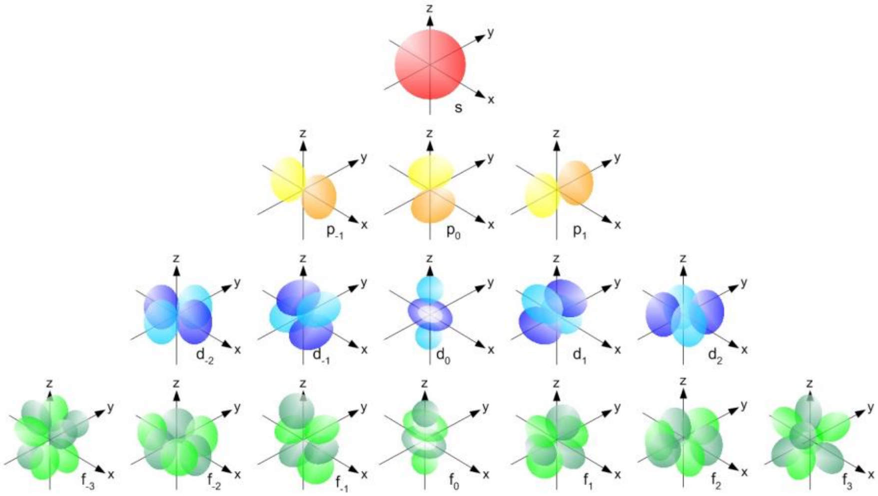
[13] Kawanaka, H. et al. (2016). Enhancement of ferromagnetism by oxygen isotope substitution in strontium ruthenate $SrRuO_3$. nature.com/articles/srep35150.

[14] Nave, J. (2017). Bar Magnet and Solenoid. University of Georgia. http://hyperphysics.phy-astr.gsu.edu/hbase/magnetic/elemag.html.

[15] Wiswesser, W.J.; Konier, D.A.; & Usdin, E. (June 30, 1972). Wiswesser Line Notation: Simplified Techniques for Converting Chemical Structures to WLN. Science: 176(4042):1437-9.

satisfy two more: magnetic (m□=±0→3 orbital positions in s=1,p=3|x,y,z,d=5,f=7) and spin (m□=±½ parameter direction). Put together, the eigenfunctions provide the so-called "electron cloud" maps (below[16]).

The problem with renormalization is confinement. Our outer perspective tells us most of how we interact and observe relativistically, but not everything. There is a reason for every physical attribute from thermal conductivity to the octet rule.



We just need to differentiate our practical level thinking perspective from the confined quantum levels the qualities and rules emerge from. Electrons see themselves quite differently pre-renormalization. They see themselves the same way nuclide groups do: as equal regular lattices. Because these are quantum, they enjoy all the QM aspect potentials for nuclide structures (see pg. 152).

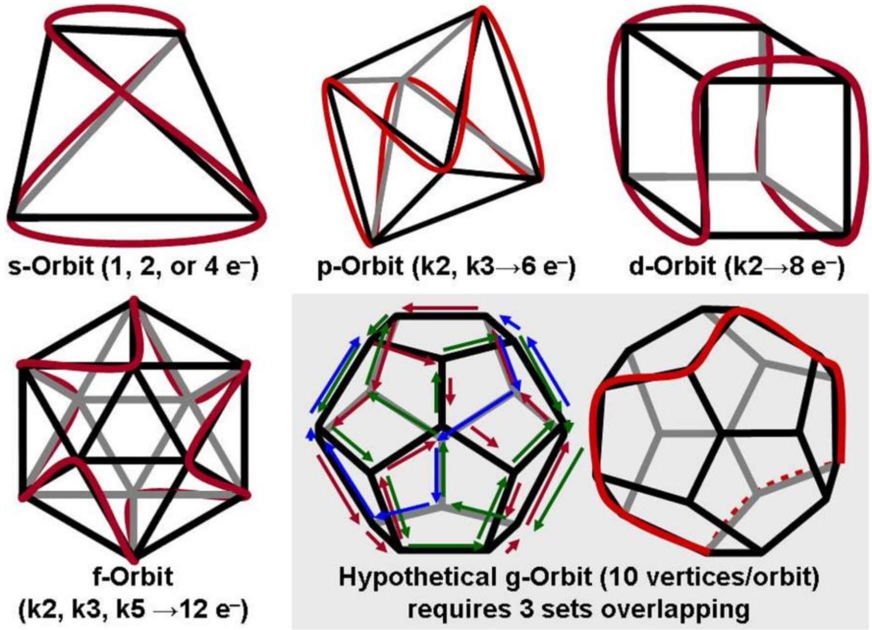
QM tends to be a rather broad category of thinking. Here we are taking it in its literal interpretation as mechanics of fundamentals. The s-orbit illustrated below has four vertices. We can think of this in semi-classical mechanics terms.

Each electron consists of an entangled pair, dividing themselves across two vertices. Those same two vertices can be occupied by another electron by changing the spin

[16] Carolina, N. (Nov. 30, 2017). 5 Ways to Learn Orbitals in Chem 130 at University of Michigan. https://oneclass.com/blog/university-of-michigan-ann-arbor/26649-5-ways-to-learn-orbitals-in-chem-130-at-university-of-michigan.en.html.

quantum number. Another pair of electrons can be added at the remaining vertice pair by adapting azimuth to vertice.

This is like having four pit stops on a racetrack. Each electron occupies two while redefining its space in a fixed direction. There are two sides to the track, so two electrons can be at the same pit stops, and two more can be at the other two pit stops. Later orbitals often “drop” electrons down to this level, which appear qualitatively in the patterns of the periodic table.



s-Orbit (1, 2, or 4 e^-) **p-Orbit (k2, k3$\rightarrow$6 e^-)** **d-Orbit (k2$\rightarrow$8 e^-)**

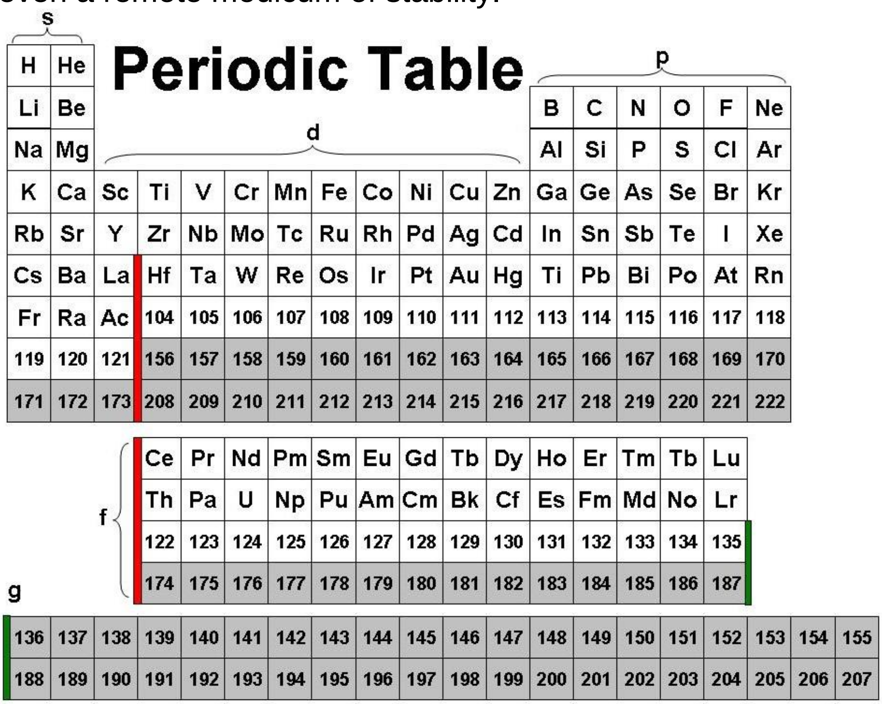
f-Orbit (k2, k3, k5 $\rightarrow$12 e^-)

Hypothetical g-Orbit (10 vertices/orbit) requires 3 sets overlapping

As a mechanical system, balance is required so you can have 1, 2, or 4 electrons in s, but not 3. Likewise, an orbit has to flow along one continuous line in one cycle without crossing over itself connecting all the vertices. The g-orbit is the only regular solid this cannot be done with. The best one continuous cycle can intersect on g is ten vertices. Additional paths cross over each other causing exclusion violations.

Traditional electron orbits fill in the Wiswesser sequence. Here they fill by vertice order limitations. This creates an entirely different set of possible configurations that can become incredibly ambiguous, but accurately predict valence states. It remains unclear, however, whether a g-orbit segment alone is possible, and to what extent it could apply.

If g could be entirely satisfied, we could also expand the possible periodic table (above). The grayed parts of the illustration require the g-orbit. Without the requisite environmental factors, related nuclides are unsustainable. Complex nuclides require their electron environment to have even a remote modicum of stability.



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