Nature of Reality or Reality of Nature

A Look at Scientific Modeling from the Perspective of Artistic Composition

by

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Introduction

The thought process associated with creating a painting and the thought process associated with developing a scientific model are very similar. They both assume that there is an intrinsic balance to everything that can be captured in some form, be it a picture or a mathematical expression. The difference between an artist's conception and creation and a scientist's conception and model lies not in the conceptualization of ideas, or the perceptual interpretation of observed phenomena, but in the method that is employed to communicate those ideas and observations. All of us exist in the same universe and observe the same phenomena.

Is "Reality" digital or analog? Is light a particle or a wave? Does Pointillism or Realism or Cubism or a photograph represent a more accurate depiction of reality? The scientist concerned with the nature of light and chemical processes would say the photograph does. A scientist concerned with quantum mechanics, however, may find a painting like "Nude Descending a Staircase" by Marcel Duchamp or "Lavender Mist" by Jackson Pollock more accurate.

An artist recognizes that both the photograph and the abstract painting create a visual image that has the "potential" to accurately depict the nature of reality. The particular aspect of reality and whether or not the artist achieves communication of its nature is purely a function of its compositional characteristics, not its style. If the artist achieves the communication then it can be classified as "good art". If it uniquely communicates some aspect of reality it can be classified as a "masterpiece". This is analogous to the scientist creating a model that when applied accurately predicts and explains observed phenomena. This is "good science". We can say, for example, individuals like Newton and Michelangelo created masterpieces in mathematics and art.

The selection of a particular style an artist uses to express ideas is analogous to the selection of a particular mathematical model a scientist uses for the same thing. In both cases the style or model is selected for use because it represents the simplest form to express the particular idea. When trying to define or express the nature of reality as a whole, any style of art can be used if it adheres to the fundamental principles found in composition theory. One such requirement is that when you look at any portion of an overall composition, it needs to have the same level of treatment over the whole composition. The question of this essay, "Is reality digital or analog", posses a question to science because as our ability to examine our surroundings increased, and mathematics evolved, different models became available and were applied to accurately define what was being observed. The evolution of science progressed from looking at different pieces of reality and then trying to put the pieces together to make a model for the whole of reality. Art theory began with a model of the whole of reality, and then defined how the pieces fit together to make up the whole.

In art, the whole of reality has been defined top down. In science, defining the whole of reality started in the middle and worked down and up simultaneously. The assumption of this essay is that they are describing the same reality. Given this assumption is true, then determining if reality is digital or analog as defined in art, and verifying the model of reality found in art can be directly related to all the different scientific models that have been developed, then answering the question of whether reality is digital or analog from a science perspective can be proposed.

This paper applies elements of compositional art theory to develop models that can be compared to similar scientific models at a high level. The process will be to translate principles found in compositional art theory into mathematical terms so that they can then be related and compared to scientific models. Principles found in mathematics will thus be the common ground for comparison.

A broad brush comparison of the Standard Model, atomic models, and models for the universe as a whole, including the four forces that have been identified in scientific modeling will be offered. In the course of this

comparison commentary will be provided surrounding the question of digital vs. analog and other questions related to this topic.

Art and Science - A Common Model for Concept Linkage

There are only a few very fundamental compositional concepts that are applied in art that need to be used in developing a scientific model for reality. First, whenever you construct a composition you view it as a unit and develop it from the outside in and from the back to the front. A visual dialog is conducted by first mapping form and color broadly across the whole composition, and then you introduce more detail and definition as you place objects from the back to the foreground. Color in the composition shift toward grey, forms become smaller and delineation of edges becomes less distinct as the observers eye recedes in space. Lines, edges, size, shape, color, light, and dark are employed to create a sense of unity and balance.

Second, unity and balance within a composition is created by arranging the elements in such a way that each element in the composition maintains a harmonious relationship to every other element in the composition and to the composition as a whole. In art as in philosophy, this is the definition of beauty.

There is a model that has been employed in art to relate these fundamental principles which has likewise been used as an illustration by scientists. The model is the depiction of the Fibonacci spiral and the golden ratio, presented here as Diagram 2. Since this model is applied in both science and art, it serves as a common model for relating qualitative concepts in art theory into mathematical concepts that can then be related to science theory.

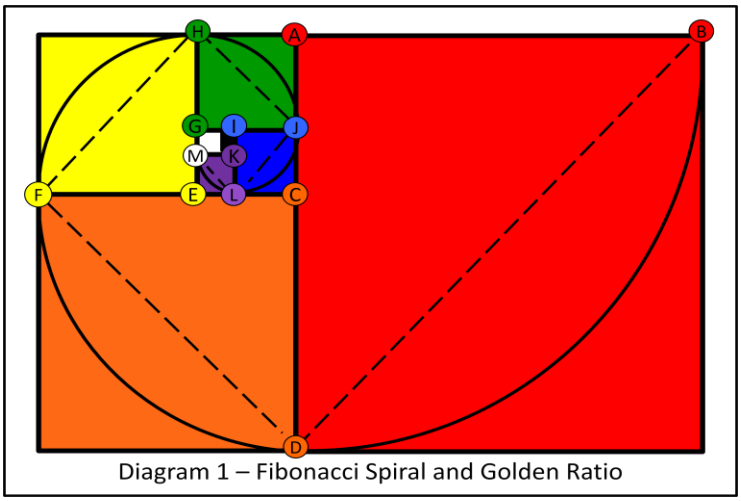


Diagram 1 – Fibonacci Spiral and Golden Ratio

The spiral in the diagram represents time. As you go around the spiral you pass through the six colors in the color wheel and you go through six spatial areas that are reducing in size. The spiral itself relates eye movement to spatial movement. The area of focus is at point "M" within the diagram. The intent behind this graphic model is to relate the compositional concept of harmony and beauty found in nature to qualitative measures. The theory is that the relationships between the elements are arranged in such a way that they define the structure of nature. For the artist, it thus illustrates how to relate form, line and color to create movement and balance in a composition.

The overall structure is segmented into seven areas shown here in seven different colors. Each of these planar areas is defined by the relationship between three points. When you look at this compositionally, it means that when you are treating a surface area as a whole, any differentiation you have within it has a triangular structure at its core. This is how tessellation found in nature is copied in art. The diagram as a whole depicts six such tessellated areas that relate to each other in reducing size such that the same form, which in this case is a square, can be replicated into infinity. This is how the fractal structure found in nature is copied in art. When you combine any two of the segments, the minimal condition is a four point structure that defines a tetrahedron. This is how three dimensional tessellation found in nature is copied in art.

When you examine Diagram 2 from the perspective of movement, you look at the diagram as a set of vectors. To do this you place yourself sequentially at points A, C, E, G, I, K and M, which are the points of observation and

you are looking at points B, D, F, H, J, L, and M from that location. From point A, you observe points B and D. Point C lies on the AD vector and from point C you can observe points D and F. Each newly defined plane is perpendicular to the previous plane. The vector formed by A and D is perpendicular to the vector formed by C and F. In total, there are seven perpendicular vectors. All of these vectors are time vectors.

When you examine each colored area in Diagram 2, it contain the point of observation and two other points that are connected by a dotted line representing linear space, and a ninety degree segment of a circle representing linear time. This relationship is constant on all the planes. However between the planes it reduces exponentially by the square of the Fibonacci ratio as you proceed from observation point to observation point.

The overall structure depicted in Diagram 2 is intended to show how nature is constructed but it is not meant to show how nature appears. To understand how nature appears you need to move yourself from your current position outside looking at the diagram on a two dimensional surface to looking at the diagram from within it. The observer is on one of the seven vectors and the time vector of the observer can be coincident or separated from the other six time vectors.

When you reorganize Diagram 1 relative to an observer time vector you extend the 90 degree segments to full circle and collapse the observation points listed previously to one point. In doing so the structure presented in Diagram 1 will look like the Front View presented in Diagram 2. This is what things look like out the front of the car window as you move through time. When you also collapse the intersection point between the six time vectors down to the same observation point the structure in Diagram 1 will look like the side view presented in Diagram 2. This is the view out the side of the car window as you are moving through time. Keep in mind that these are still two dimensional illustrations of the model. The perpendicular view shown in Diagram 2 is when you are looking at any object down the same time vector as the object. In the Side View of Diagram 2, you are looking at the object from the outside and are moving along with the object on a parallel time vector.

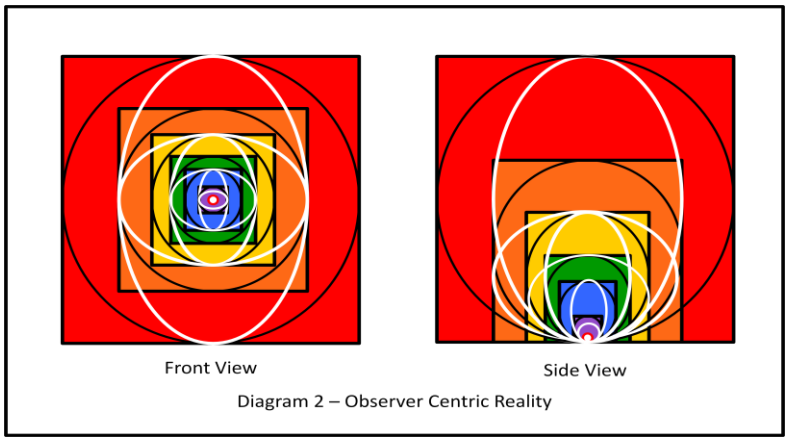


Diagram 2 – Observer Centric Reality

When we talk about reality we are making a distinction between the objective universe and the real universe. The art composition model views the objective universe as an imaginary construct composed only of time. It views the real universe as composed only of time and cognition. The real universe requires an observer.

As a result of this, all the circles and ellipsis in Diagram 2 represent the edges or the boundaries of time manifolds. The time manifold associated with any one vector is circular or spherical, but the time manifold defined by multiple vectors is ellipsoid. An observer is always contained within their own time manifold. How the time manifold of the observer is positioned relative to the other six vectors determines how everything appears. The "Real Points" that form the lines, triangles and tetrahedrons embedded in an artistic composition occur at any point where time manifolds intersect. In Diagram 1 the art composition model defines thirteen points to establish the relationship and existence of seven time vectors and provides six points of intersection between them.

In the Art Composition Model, Reality is Digital

If you translate the concepts identified in art compositional theory to more geometric terms, there are several variables that have to be considered. The first is whether you want to be able to apply it to a static or dynamic

model. The distinction here is whether or not time is included. The other variable is whether it is objective or real. The distinction here is whether or not an observer is in it. Table 1 below shows the different dimensional structures possible given you are restricted to defining everything by a point, a line, a triangle or a tetrahedron within the limits of the thirteen points in the compositional model.

#Dimensions	Total Points	Observer/Origin Point	Points Available	#Points/dimension	#time manifolds
0	13	1	12	1	12
1	13	1	12	2	6
2	13	1	12	3	4
3	13	1	12	4	3

Table 1 – Alternative Dimensional Structures

The unifying compositional structure employed in art is the structure on the bottom line of the table highlighted in yellow. Particular styles of art, however, like particular models in science, may use one of them or all three. The difference between art and science is that because art composition always works relative to the unifying over all compositional structure, it has a framework to relate to when composing in one of them, or in any combination of them. The unifying compositional structure defines a real, dynamic universe that includes an observer, or point of origin and is composed of a set of three three-dimensional time manifolds on one time vector. In this framework, definition of real space is defined as the tetrahedron that is formed by the points where these three time manifolds intersect.

So is the art compositional model of reality digital or analog? In so much as it is limited to defining everything by either a point, line, triangle or tetrahedron, at any moment spatial structure can be defined discretely and hence digitally. In the art compositional model, the spatial geometric structure found in reality is determined by how some set of time manifolds intersect. So the question of whether reality is digital or analog boils down to whether or not time is digital or analog.

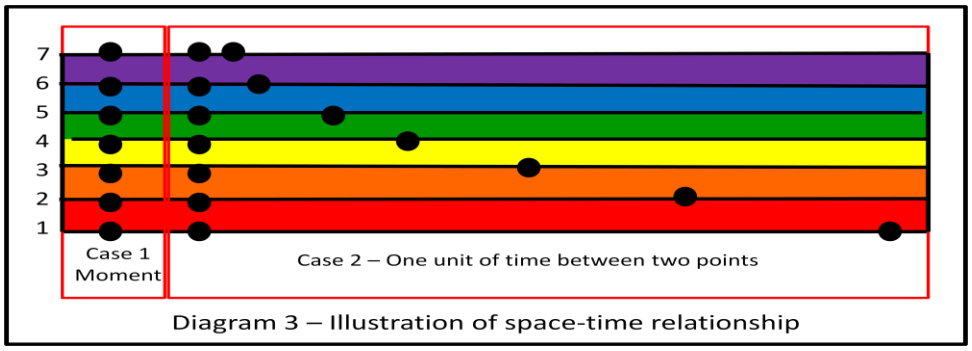


Diagram 3 – Illustration of space-time relationship

If you place the seven time vectors alongside each other you get a view as depicted in Diagram 4. Case 1 is how a single point looks in a time manifold at a moment in time. The time separation between the points on the seven layers is zero. The spatial separation between the points is .618. This is looking at time sideways. Case 2 in Diagram 4 shows the spatial distance between two points given a unit of time as measured by an observer on layer seven. One unit distance per one unit time on layer 7 is equal to 1.618^6 unit distance to one unit time on layer 1. All time manifolds are defined as one unit of time. The spatial size of a time manifold is dependent on what fractal layer it is on. The amount of time it takes to span the time manifold of the largest and smallest time manifold is the same.

When you apply the concept of fractal structure and tessellation with respect to time manifolds, time manifolds are what is being fractalized and tessellated. Tessellation articulates a particular fractal layer with adjacent time manifolds. The universe is articulated with multiple fractal layers. If you start with the largest time manifold, each lower fractal layer manifold is nested within it in reducing size until you reach the smallest time manifold. All time manifolds, regardless of size, have the same structure and dynamics with respect to time.

Time manifolds if unobserved are imaginary. Points where time manifolds meet or intersect, however, are real and measurement between them and unitization is possible. The only thing in a time manifold that can be quantified is time and regardless of the size of the spatial area bounded by the limits of the manifold, crossing it in any direction only takes one unit of time.

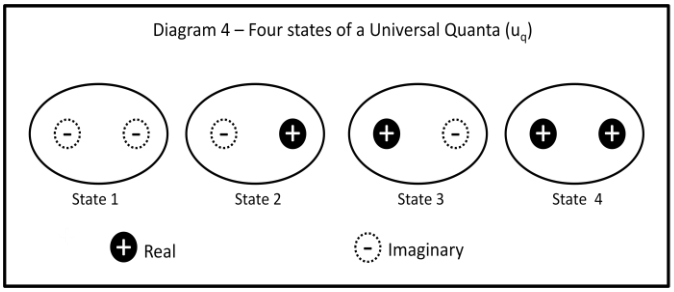
Because reality is limited to discrete points where time manifolds intersect, and time manifolds are discrete unitized time periods, and time periods are the only thing that can be quantized across all time dimensions, in the art composition model, reality is digital.

Translating the Art Composition model to Science Terminology

The objective unobserved universe exists only as an imaginary time construct. The real universe is formed by the introduction of an observer within it. The real universe is only composed of time and cognition. A moment in time and a moment of cognition are linked as awareness. Two moments in time are linked as a unit that is a time period that will be referred to in this essay as a time quantum (t_q). The two moments of cognition are linked as a unit that is a cognitive period referred to as a thought (T_q). There will be no further reference to thought in this essay. For the Art composition model to be related to a science model, all the terminology of science needs to be expressed in terms of time and cognition. The approach to this is to define a "point" in terms of time and cognition and proceed to define mathematical models that match the art compositional models and use the mathematic models to link to the science models.

Universal Quanta – Creating a Point

The introduction of a separate cognitive element into the objective universe is what transforms it from an imaginary construct to a real construct. When you look at a particular point in space it forms a cognitive dipole between a real point where the observer exists, and an imaginary point that only exists in the mind of the observer. A real point in space "R_0" exists as a dipole of two imaginary points in time. The imaginary points lie on the universal time vector and represent two adjacent points in time, one of which is the present moment. If viewed in isolation a point in real space can be thought of as time going around in a circle of real radius zero and imaginary radius one. This is the composition and structure of a universal quanta "u_q". Its structure is depicted in Diagram 1.



You have to keep in mind that this is a time dipole so do not view the real and imaginary points as spatially separated. State 1 represents how a u_q exists in isolation. That is, it is a point in time but has no cognitive element in it or observing it. State 2 and 3 represent conditions where it has a cognitive element in it, and state 4 represents the condition where it has a cognitive element in it, and a cognitive element outside observing it. State 4 is the only state it can be observed in over time. This is the "always on" condition that defines a real point. State 1 on the other hand exists but cannot be observed. This is the "always off " condition. If you view State 4 as light, you can view State 1 as dark and state 2 and 3 as grey. This is how chiaroscuro will be integrated into the mathematical models. In the rest of this essay state 1 will be referred to as "u_{iq}" or an imaginary point, and state 4 will be referred to as "u_q" or a real point and time will be quantized as "t_q". All further definitions in this essay will be built using these three elements. All an artist needs is time to make a point.

Digitizing Reality – The Creation of a Finite Universe

Given that all that exists in reality is universal quanta, the universe as a whole can be defined as the sum of all universal quanta and all the time based relationships between them. Expressed mathematically, if the total number of real time quanta that have occurred since the universe was created to the present moment was set equal to "k" then in a finite universe:

$$\text{Real Universe} = ku_q$$

If we proceed back to the zero point of time and propagate imaginary universal quanta "u_{iq}" and real universal quanta "u_q" incrementally as time incrementally steps forward in a unitary fashion, then we can form a series of relationship between time "t_q" and the imaginary "I_n" and real "R_n" dimensional structures.

Layer	Imaginary	Real
1	$I_i = 2^0 u_{iq} t_q^1$	
2	$I_0 = 2^1 u_{iq} t_q^2$	
3	$I_1 = 2^2 u_{iq} t_q^3$	$R_0 = 2^0 u_q$
4	$I_3 = 2^3 u_{iq} t_q^4$	$R_1 = 2^1 u_q t_q$
5	$I_6 = 2^4 u_{iq} t_q^5$	$R_2 = 2^2 u_q t_q^2$
6	$I_{12} = 2^5 u_{iq} t_q^6$	$R_3 = 2^3 u_q t_q^3$
7		$R_4 = 2^4 u_q t_q^4$

Table 2 – Evolution sequence to real space

Next we need to define the relationship of time and space as depicted in the Composition model. A time manifold takes the form of a tetrahedron. The angles of the observer vector relative to the six time vectors needs to be mapped. For simplicity the Fibonacci ratio will be designated "f^x" denoting 1.618034 to the power of "x". A mapping of the angles relative to the x- axis as the base of one t_q and the y- axis equal to the power of "f" for each layer is presented in Table 4.

x	f^x	t_q	Angle in degrees
Observer Vector	0	0	0
0	1	1	45
1	1.618	1	58
2	2.618	1	69
3	4.236	1	77
4	6.854	1	82
5	11.09	1	85

Table 3 – Angle between 3D-Time and Universal Time

The observer vector is actually a point defined as the present moment on the vector of universal time. Observationally, this means that when it is coincident with one of the six vectors that define real space, the other vectors will each have an angular displacement relative to it. The ones that are one t_q away will always be at a 45 degree angle with respect to 3D vs. universal time. If the observer vector is outside in an independent position on the universal time vector looking across all six vectors, the vector with the largest time displacement will be $6t_q$ away in 3D-time and in the same moment in universal time and be at an angle that is 85 degrees relative to its side view. That is nearly perpendicular to 3D time which is why I characterize it as nearly looking at time sideways. From an art perspective, this is the fundamental concept behind cubism. Given this understanding of hyper-time, we can now look at what the relationship between these six-time vectors is relative to time based phenomena in physics. This is presented in Diagram 7.

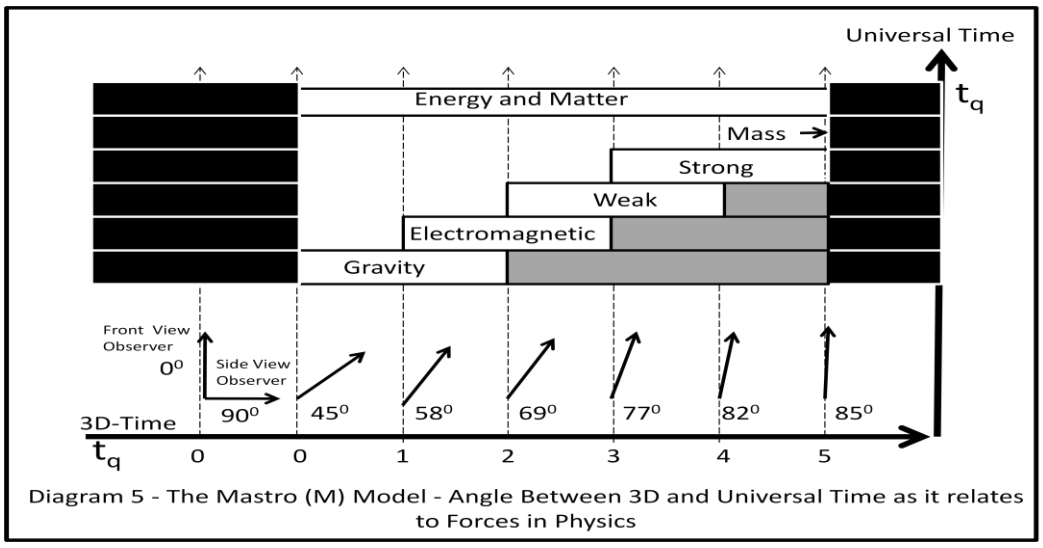


Diagram 5 - The Mastro (M) Model - Angle Between 3D and Universal Time as it relates to Forces in Physics

For reference, if you look at this in conjunction with the time manifold of the earth, a human being observer is on a vector coincident with the vector going through the center of the force of gravity. Your feet are on the vector going through the center of the electromagnetic force. From this position the vector at the center of mass will be $4t_q$ away at an angle of 85 degrees. I point this out because it demonstrates one of the impacts the existence of an observer has on what is being observed. Outside the seven vectors these forces also exist, but they turn from light to dark. The center of mass is at a point on the vector that is at a $5t_q$ displacement.

The joining of all of these vectors into a single time manifold is the concept of matter and energy. These physics concepts employ all six vectors. In terms of matter, this is geometrically defined by two points on each of the six vectors. This places a set of six tetrahedrons linked together both horizontal and vertical that takes the form of a double helix. For you analog folks this can be thought of as a wave through 3π radians. When you unitize mass for duality and symmetry in 3D space, it requires eight time manifolds. This is one time manifold enveloping six time manifolds enveloping one time manifold. This structure will be referred to as mass and be denoted "m" in this essay.

For the next fractal layer a similar process needs to be applied to represent matter. Matter is a balanced system between mass, the four forces, space, and time. Given this, a static definition for the structure of matter can be given as:

$$\text{Given } 2^3m = 2^3R_4 = 2^7u_q$$

In order to retain symmetry and balance, if we set n, p, q, and r equal to the space envelop of the four forces and i equal to the imaginary u_{iq} content, to retain symmetry and balance we say:

$$n = p = q = r = 2^3R_4$$
$$\text{and}$$
$$\text{Matter} = 2^3m + 2^4n + 2^5p + 2^6q + 2^7r + 2^8i$$

This is the point that I will stop the translation from the mathematical art composition model to a science terminology model. In terms of digital vs. analog, the model is still digital. The discrete definition of a wave is a double helix, and the discrete definition of a sphere is a tetrahedron. The question becomes whether or not a digital model is practical. Pointillism uses dots, Impressionism uses a broad brush. The equation proposed above for matter has a huge volume of u_q. Mapping the layout of an individual electron would be astronomical. The result of this is that it is much more practical to use tools like calculus for modeling. Coming up with an analog model in quantum mechanics can be established by using waves, but you have to put the waves perpendicular to each other and look at points of intersection, or limit conditions, for it to make any sense. In order to do this you have to recognize that when you are looking at a phenomena like gravity and the strong nuclear force it is like looking at a cubist painting. You are looking at a single object from two directions at the same time. When you observe a phenomena like matter where you are looking at all forces, you are looking at

some forces from the side and some forces from the front. Which ones are parallel and which ones are perpendicular is dependent on the observer position relative to it.

It should be noted that converting analog models to digital or vice versa will not result in a unified view, if the models behind the theories are not accurate. In other words, they still will not fit together. Bad art is bad art. When something doesn't work sometimes you are better off starting over, but you have to see where it is things are wrong before you do. The two most difficult things for an artist are to see what is wrong with a composition, and to know when you are done. With that in mind I will very briefly review a few principles and theories found in scientific dogma, from the mathematical translation of art theory.

Comparing Principles between the Art Composition and Science view of Reality

The universe from the largest to the smallest has a fractal structure of spherical nested time manifolds. The real space from the largest to the smallest takes the form of a tetrahedron. This characteristic should be observable in the underlying structure of the background radiation observed when you look out into space, and in the underlying structure of quantum phenomena described in the standard model. All time manifolds are four dimensional. Time manifolds that have time manifolds nested in them all define a set of three dimensional spaces. When these inner spaces are viewed individually, they each are homogeneous to a solid sphere. As a group inside the manifold, they are homogeneous to a solid Klein's bottle.

In terms of the formation of the universe, its origin is at two imaginary points outside of real space. These two points went through seven windings of the cosmic clock, and each winding took place at one time increment from the previous one. This origin displacement resulted in the creation of seven time vectors, each perpendicular to the previous one. The present moment is currently at a point between these windings. The universe was defined as a whole in the first few increments of time. As the clock runs down, the vector of time at any real or imaginary point is back toward this origin. The origin serves as a negative pole, and all points in the universe are positive. All points are equidistant from the origin. Balance is propagated in the universe at all points simultaneously. This addresses the monopole and the horizon problem in science.

In terms of the speed of light, it is only constant relative to the time vector it is on, which is the vector of the observer. Time is the only constant. Light has six different velocities relative to the other six time vectors. In terms of waves, as light jumps between spaces defined by these vectors it is passing through time manifold boundaries and it refracts at each one. All waves are standing waves. The speed of light cannot be used as a measure of distance and can only be measured as a unit of time relative to time manifolds. No two points in real space, regardless of how far apart they are spatially, are ever more than $12t_q$ apart in time.

In terms of curvature, any real point is at the intersection of two time manifolds. Any point has zero curvature. When you have two points you have two overlapping time manifold borders. In these spaces the gravitational constant is both $+\pi/2$ and $-\pi/2$. At the border of the universe as a whole and the border of quantum particles the time manifolds cannot overlap because these define the time boarders and intersection can only be at a single point. This addresses the flatness problem in science.

Observation of red shift in the Hubble deep field is attributed to two things. The first is refraction. Refraction is the source of what the shift is being measured against. Refraction through multiple time manifolds between the point of observation and the distant galaxy being observed is taking place. The second is spatial curvature. If you go any direction in space far enough you end up right back where you started. The further you go, the more time manifolds you are passing through and the more curvature you go through.

In terms of string theory, understanding the time-space relationship of the six time vectors and the geometric construct of everything should be sufficient to put something together. Just remember what the "M" stands for. If you run into trouble you should talk to someone like Eric Clapton. If you want an analog view of a balanced system, it looks something like Diagram 6 below.

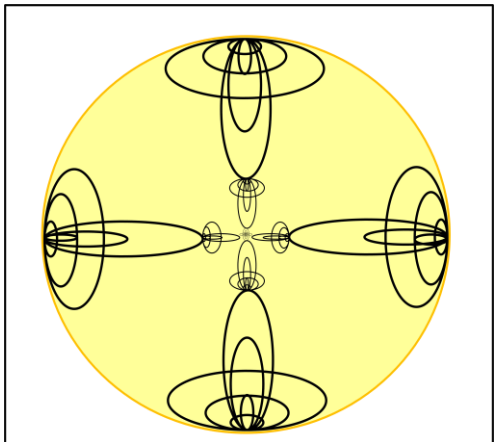


Diagram 6 – Analog view of a Balanced System

When you view this balanced system structure depicted in Diagram 6 from the perspective of a scientist in quantum mechanics, it is the structure of matter or an atom. If you view this from the perspective of an astrophysicist, it is a galaxy or a solar system. At the center of a balanced system is an event horizon that is the border of the universe where the current and the future meet. In an atom or galaxy this will take the form of a sphere, in the smallest particle of matter or a star, it will take the form of a point. When you view this structure from the perspective of an artist, it is the balance of nature.

Summary – Is Reality Digital or Analog?

All that exists in the universe is time and cognition. Reality is defined by the perception of time, and this perception is broken down into a sequence of moments. As a result, reality is by its nature digital, because we perceive time as digital, and time is the basis for how we process information moment to moment. Due to the fact that there are so many points, when processing information analog models are most practical.

There is no way of knowing if the objective universe is digital or analog. I can offer you no verification or validation or rigorous proof in a scientific sense that any of the relationships defined in this essay are objectively true. As an artist all I can assure you of is the same thing I know within the confines of my own awareness, and that is that I am. So what this boils down to is that reality is what you make it. The real universe can be defined as either digital or analog, but when you choose a way, give the universe the respect that it deserves and make it a masterpiece.

References: Any term used in this essay can be found on-line in Wikipedia.