Fractal Geometry Leading to The Periodic Table; Application of Algorithm Dimensional Model to Large Scale Phenomena

Gregory M. Friedlander[*]

Clean Water, Inc, Attn: Gregory Friedlander, 11 S Florida St, Mobile, AL 36606, USA

[*]**Corresponding author:** *Friedlander GM, Clean Water, Inc, Attn: Gregory Friedlander, 11 S Florida St, Mobile, AL 36606, USA, Tel: +1- 251-470-0303, Email: gmfpc1@gmail.com*

Abstract

Energy and Matter are the same thing. Space and Energy are the same thing. Time and change are different. These conclusions give rise to a different view of Atomic and molecular Structure and force. The model universe is a Quantum Universe, Quantum solutions for quantum point driven, Time Free, Dimension Free, Thermodynamic Free and therefore entropy free below ct3-4 compression.

AuT built this list:
1) All dimensions present (at least 6) exist together within the matrix of the universe; and in any regional matrix, subgroups of these dimensions are present.
A) Space has no dimension, precharge exists in a single dimension, prephotons exist in two; neutrons (complete matter) in 3 and black holes in 4.
B) The definitions of time and space mean that exchanges of information state (ct state) between space and prephotons occur independent of time. Time begins between the prephoton state and ends with compression to neutrons.
2) All change is quantum change in response to a single variable leading to the universe existing as a series of quantum states or snapshots. Force and time are effects based on this quantum change.
3) Time and change are different. Changes in the single variable leads to time, but time is not required for that underlying change nor does it affect that change.
4) Time is an effect like force and dimension of the quantum change between states some of which occur without a time-based reference giving rise to features like wave - particle duality and the impression of charge among other features.
5) Space is made of the same type of information as all other states (energy, matter, black holes) which are folded from space based on exponential compression/folding.

6)   Waves, Photons, Electrons and protons are examples of transitional states (ct3-ct4) between prephotons (ct3) and neutrons (ct4). Atoms (after hydrogen) and molecular states through neutron stars are transitional states between neutrons (ct4) and black holes (ct5) along with intervening transitional ct3-ct4 states.

7)   The focus of this paper is on different Quantum fractal forms and their role in computing and calculations; allowing a new way of looking at the periodic table of the elements and force.

Introduction

This is a summary article. It gives applications to Physics associated with the article first published for peer review in the Journal of Physical Mathematics October 24, 2018 (Vol 9 Issue 4). "Algorithm Model defining Dimensional Features." References are made to "The Original Article" where appropriate. An update to the Original Article is currently being published in the Journal for Advances in Computational Physics.

Details of this theory can be found in Algorithm Universe Model, (hereinafter AUM or Algorithm Universe Model) and Algorithm Universe Theory Compendium Volumes 16th edition and Vol 23rd edition. References are liberally provided where appropriate. Those books are over 800 pages long together. Only the latest editions of these works correspond with this article. Figure numbers come from Algorithm Universe Model. PUBLICATION OF SOME DRAWINGS IN THE PRINT VERSION WAS IMPOSSIBLE. THESE DRAWINGS WITH NUMBERS ARE SHARED AT A FREE DRAWINGS LINK which can be found here: https://my.sendinblue.com/users/subscribe/js_id/3ur2i/id/1

Only summary conclusions are made in this article concerning the underlying structure of the observed universe.

Base Equations

The data generating equation is the denominator of pi, called Fpix herein and is built from -1 according to this formula (**[-1^x plus 2x (-1) ^x-1]**). This is the first of three iterated functions.

The Function of Fpix:

Built into each solution for fpix is a fuse. This fuse is defined by the evolving value of the solution.

As the count increases by a quantum amount, a new solution is generated. Each solution starts with the value -3 (-1 or 1 in some embodiments) and the value of the solution is the fuse between the current solution and the next solution to fpix. So, after 3 changes in x, the first solution changes to 5. After 5 changes in x the first solution changes to -7 and so on. By the time there are 8 changes in x, there are 8 solutions, each having a fuse burning at a slightly different rate.

A broad but precise calculation of the number of data points at the universe currently is possible. At least for the visible universe it is less than 5.2916E+153 and the average fuse length is a fraction of this number determined by the minimum fuse (3) plus the maximum fuse (e.g. 10^120)/2 or roughly 1/2 the maximum fuse length.

How the universe is displayed with Fibonacci (F-series) compression

The Original Article shows how F-series compression can arise from the fpix solutions. Ratios are generated by compression of fpix information.
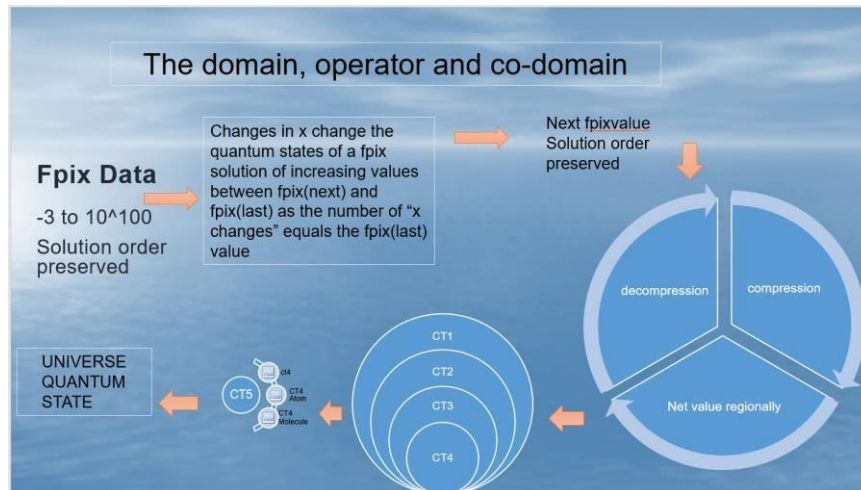

Figure 2: The domain, co-domain and operator diagram.

There are two parts to compression: 1) Compression states and 2) Hinge States. Specific equations exist for both based on the inherent matching of positive and negative fpix solutions resulting from their staggered fuse lengths. There are two directions, compression and decompression although both can be partial. These equations each contain 2 iterated functions $2f(n)x(2^n)$ on $2f(n)-1x(2^n)-1$.

Hinge State solutions: $[2f(n)-1]$ ^$[2^n-1]$ also called Hinge solutions.
Compression State solutions: $2f(n)\textasciicircum 2\textasciicircum n$ also called compression solutions.

f(N) - CT State	2*f(n)	2^n	2f(n)^2n	Dim State	Force	
			Next lower states		prior to	ct1 states
1	2	2	4	Space-0	current	4
2	4	4	256	precharge 1	Gravity	256
3	6	8	1679616	Prephoton 2	Charge	429981696
4	10	16	1.00E+16	Neutron/Matter-3	Energy/Strong/time	4.30E+24

| 5 | 16 | 32 | 3.40E+38 | Black hole4 | Weak/very Strong | 1.46E+63 |
| 6 | 32 | 64 | 2.14E+96 | Universe 5 | Unknown | 5.29E+153 |

Table 2: Compression States.

The combination of odd (hinge) and even (compression) state solutions gives rise to dimensional features observed.   See the Original Article and AUM for details.

A short summary of Force

Force is nothing more complicated than the net result of compression vrs decompression for each compression state.
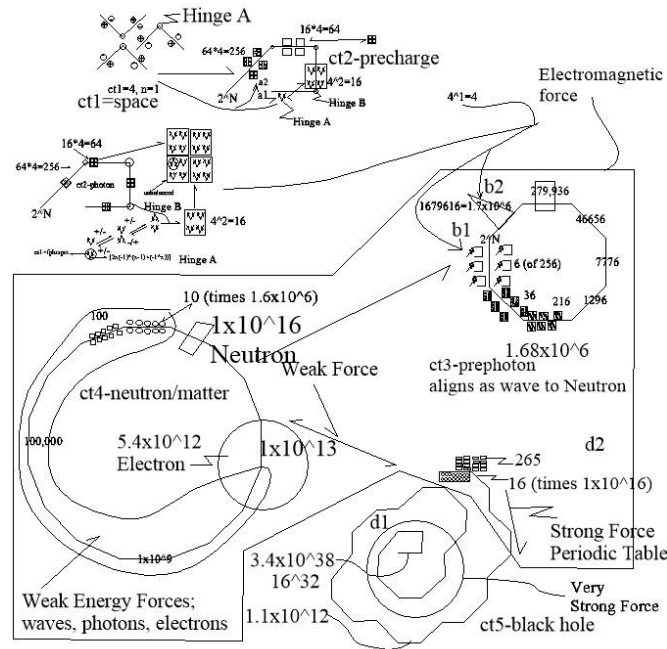

Figure 15: Shows compression information arms from ct1 to 5 with the associated force.

CT	2f(n)^2n	Dim State	Force	AuT Force		change	PreAuT	
State	Compr		prior to	spew	Aut Strength	range	recorded	
1	4	Space-0	Current				strength	range
	256	1	Gravity	G/AG		ct1-2-1	1	inf-g
2	1679616	2		PreCharge				

		ct2-3	Charge	net sum precharge	variable	ct3-4-3		inf-EM1
3		3		Prephoton		ct2-3-2		
	10^12-10^13	ct3-4	P-E interact	net compression	4.5*10^1210^16	P-N	Prot/Elec:abs	
4	1.00E+16	ct3-4	Energy//time	Atomic Prot/Neut abs	e=mc^2 (10^16)	N-P	10^16	
	Transitional	ct4-5	PostAtom	N-P-N weak	10^25	N-N	10^25	10^15
	Transitional	ct3-45	Forced molecular	N-P-e-P-N: EM	10^36	N-P	10^36	Inf-EM3
			Strong	N-N 2 arms	10^38	N-PE	10^38	10^18
5	3.40E+38	ct5	Very Strong	ct5 collapse	10^96	N-BH		
6	2.14E+96	ct5-6	Non-Weak	ct5toct6	10^96<	BHU		

Force Table-New

As can be seen from the table above, loading and unloading of information arms yields a scale that is directly proportional to observed forces.

Examples are the nuclear reaction (10^16 scale matching e=mc^2); the force holding the nucleus together having a scale of 10^38 matching the compression of ct4 to ct5; and the approximate mass of the black hole (single) matching approximately the same 10^38 scale based on the observation of neutron stars and minimal size black holes. It is worth noting that a black hole is a quantum state and the observed difference in size of black holes must be attributed to their pairing and alignment with neutron stars just as the nucleus of the atom shows a minimal alignment of protons and electrons (H); and normally a combination of Protons, Electrons and Neutrons (e.g. He).

A more detailed discussion along with an explanation of the unobserved states and the unmatched states can be found in Algorithm Universe Model.

Summary of Time

The drawing below is a representative closeup of the ct1 movement within a ct3 state as information compresses and decompresses. Ct2 states are shown with relative locations. All ct1 states rearrange based on the ongoing fuse solutions. Over several values of x, CT1f may

move to ct1h, changing the arrangement of information within the ct3 state shown as the largest circle.

We can observe and affect our environment, i.e. self-determination exists, because of our ability to manipulate the dimensional matrix from the perspective of this internalized submatrix or sub-ratio.
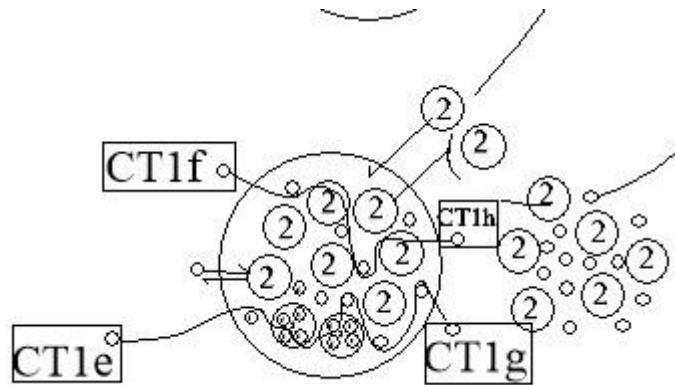

Figure 19: This is a Concept drawing of how ct1 decompression changes ct3 history to generate time, which is cut from figure 9 showing exchanges in a broader ct3-4 complex.

Time arises gradually, it requires ct3-4 wave states to store enough information to be observed as fixed histories relative to the changing histories as some quantum states change while others remain the same.
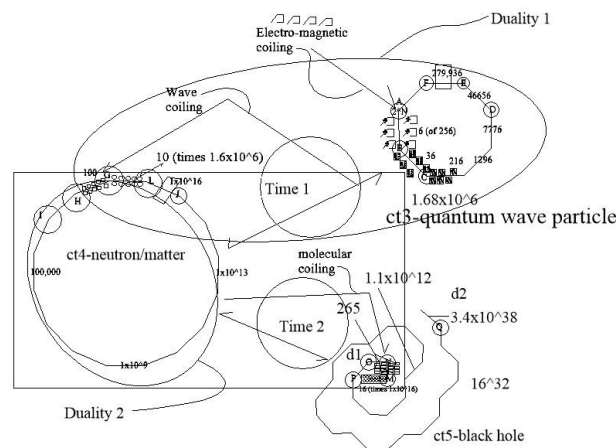

Figure 41: Shows the interaction of time and duality over various compression states.

The drawing above shows how time builds from a poor source of saved information in ct3 states (time 1) to a more complex and full historical record (Time 2) incorporating wave states that exist in the ct3-4-5 matrix. Waves result from pre-time changes in quantum photons observed together once time is applied (see AUM for details).

Fractal Geometry and Transition States

One key takeaway from the discussions of compression and time is that our observations are tied almost exclusively to what are described as ct3-4 transitions because that is where time exists. This limited area of time is expanded over ct5 initial compression to spread time evenly over a planet despite regional differences experienced, for example, by an individual standing still at an intersection and a second individual moving relative to the first at 500 mph in an airplane, although the two are normalized by the galactic movement at 790,000 mph.

Dimension vrs Information Concentration

Increases in dimension result in a smaller dimensional profile. This means that as the amount of aligned information increases, the volume occupied is reduced. (Figure 8).

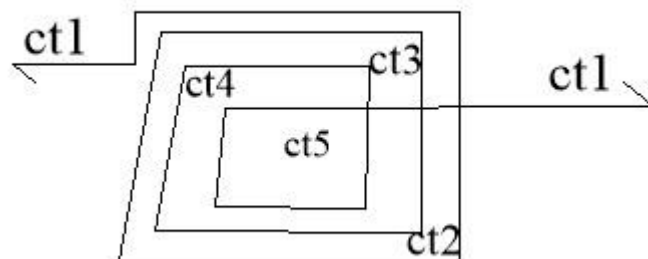Higher compression states are folded within the lower compression states and bleed together.

Figure 14: shows how larger mass states have smaller dimensional footprints.

This shows how fractal detail is increased as compression increases. Dimensional states coexist. Space is non-dimensional, precharge has one, prephotons two, matter 3, black holes 4. We separate dimensions through perspective. Whatever happens to prephotons within waves is invisible. The location of T6 (theorized) photon fractals are partially hidden in a pre-thicktime state, so we see the net result as wave particle duality. Time as we experience it involves all the wave states, but since prephotons carry some information forward, there is a pre-thicktime state which holds part of time.

Distortions: We see zero, one and two-dimensional features as if they were 3 dimensional. We see change limited by wave state rate change which distorts our perception of the other, lower (cT2, 3) state changes.

Application of the Fractal Model: Part II

The application of the iterated functions generates the Periodic Table, explains how the atom operates and defines chemical Reactions.

The Electron

The electron is a transitional state between a complete and partial ct4 state at the twelfth level of compression (T12) in the 16 levels or folds of compression corresponding to 10^16 compression in the compression equation. Because of relative mass issues, this T12 compression state exists within a T13 electron bundle of information.

16	10,000,000,000,000,000.00	1.00E+08	215443.5
15	1,000,000,000,000,000.00	31622777	100000
14	100,000,000,000,000.00	10000000	46415.89
13	10,000,000,000,000.00	3162278	21544.35
12	1,000,000,000,000.00	1000000	10000
11	100,000,000,000.00	316227.8	4641.589
10	10,000,000,000.00	100000	2154.435
9	1,000,000,000.00	31622.78	1000
8	100,000,000.00	10000	464.1589
7	10,000,000.00	3162.278	215.4435
6	1,000,000.00	1000	100
5	100,000.00	316.2278	46.41589
4	10,000.00	100	21.54435
3	1,000.00	31.62278	10
2	100	10	4.641589
1	10		2.154435

CT4 Transitional State Table

The observed "photon" is believed to be a T4, T6 or T8 state. At this level, not all the fractal states result from compression (even) solutions (e.g. T15 being the cube form of T5).

Any ct state, transitional or otherwise can be viewed as a wave if time is eliminated since waves are primarily the result of pre-time movements when time is applied along a line defined by a higher compression state. A discussion of this in detail along with exemplary drawings can be found in Algorithm Universe Model.
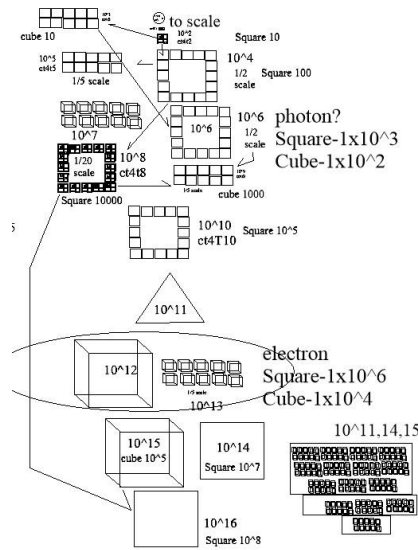
Figure 30: f shows the neutron compression at the ct3-4 stage.

Three different (2^n, squared and cubed) fractal stable structures suggest this: the electron is t12, the photon is the other dual fractal stable state, T6. In AuT it is the point where cause and effect become blurred. AuT suggests that below the level of cT3 compression, pairing of information is a pure function of the alignment of positive and negative values because any misalignment causes a breakdown to the next lower state.

Size of Fractals: The Electron and Proton

The result suggested by the model above is:
Hydrogen is not a single unit of ct4, it is a ct4 transitional state which co-exists with ct4 neutrons and is eventually squeezed out as compression increases.
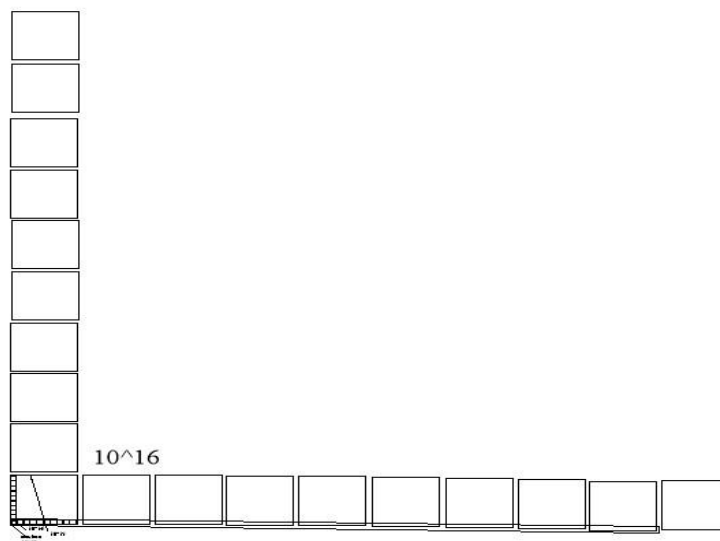
Figure 34: Shows the relationship of information contained in the electron vs the proton or neutron. What this shows is an "informational approach to the electron/proton pair.
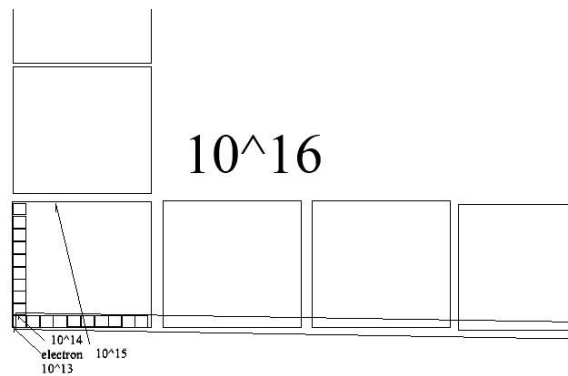

Figure 35: shows a closeup of the scale of the T13 place from which the electron and electron bundle arise.

The drawing shows the relative size of the electron, a part of the square shown, relative to the size of the Proton/Neutron. Correctly it shows that charge is not balanced between the two extremes in terms of information, but the volume of the T16 state drops exponentially. While the amount of information is exponentially higher for the t16 proton, the dimensional size of the photon and electron may be equivalent. Likewise, while there is only a minor difference between the amount of information in the photon and in the neutron, because neutrons have a pi numerator equal to 4 (as opposed to approximately equal to 4) the neutron is substantially smaller in volume from a three dimensional view than the proton, just as a black hole is smaller than a neutron star and for the same reason, it effectively extends into (folds into) another dimension (see figure 14).

Balancing Charge Between Unequal Parts

Figure 14 above explains how the unequal information states can balance charge. The electron is dimensionally as large or larger than the proton notwithstanding the information imbalance because of increasing dimensional compression.

To understand the charge, it is helpful to understand how the Neutron holds the atom together and how the proton holds the electron in orbit in the fractal matrix.
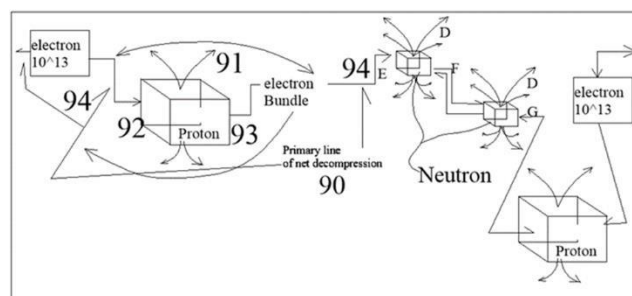
Figure 40b: As shown in the figure above due to dimensional compression, the electron and its cloud is significantly larger than the proton and the neutron, dropping fully into 3 dimensions is smaller still. The pre-time absorption of ct1 into the Proton followed by the spew of a higher compressed state is viewed as positive charge.

The basics of this process are as follows:
1. The Proton absorbs ct1 from the electron and the surrounding cloud. The electron being a more compressed state yields the majority of this ct1 information. The proton folds some of this ct1 into ct2 creating the effect of gravity. Since the amount of information within the proton matrix must remain constant, unfolded ct1, ct2 and perhaps ct3 spew out and gives the effect of charge and movement.
2. The electron does this same process, absorbing from the electron bundle, with lower net spew ct states and the neutron does this same process with higher net spew ct states. In this way, they would appear, subject to dimensional differences, the same as a Quasar, but the different absorption and spew rates and states give rise to the appearance of different charge or force results although they are all tied to the basic process of loading and unloading information arms within a regional matrix (in this case the overall matrix is the "atom" and the sub-regional matrix are the electron-proton and the proton-neutron matrix within the atomic matrix.

The Periodic Table in AuT

Perhaps the greatest single triumph in chemistry is the periodic table of the elements.
Atomic design has largely been forced into agreement with the table but not without cause.
1. The proton and electron are ct3-4 transitional states and therefore different from Neutrons which are ct4 states.
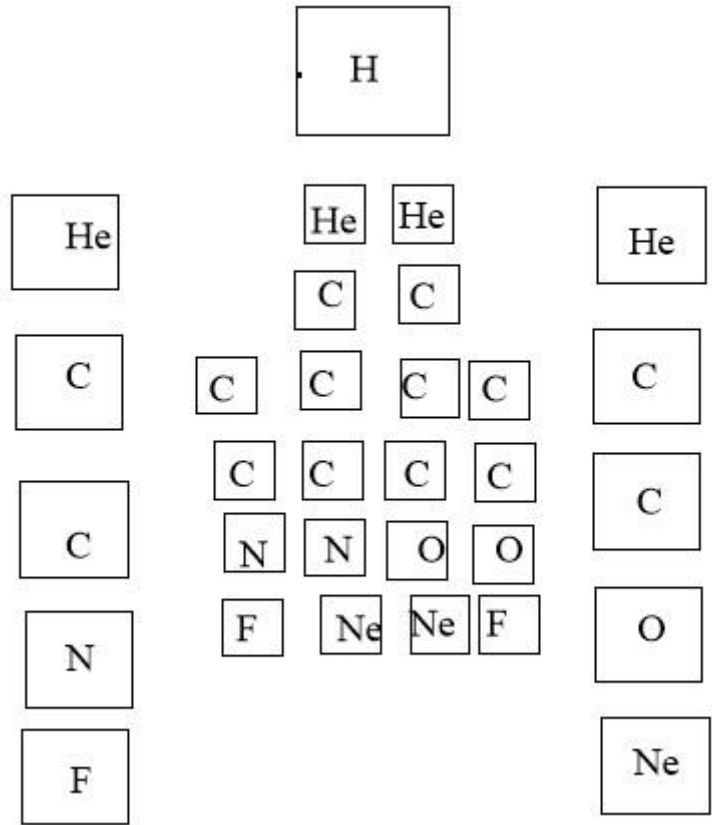
The first line of periodic table

Figure 37: Shows the conceptual interaction of the second line of the periodic table.

This view shows how the compression builds requiring primarily, but not exclusively, a core of Neutrons (smaller boxes) with Neutron pairs or triplets at a minimum necessary to maintain stability surrounded by photons (large-boxes).
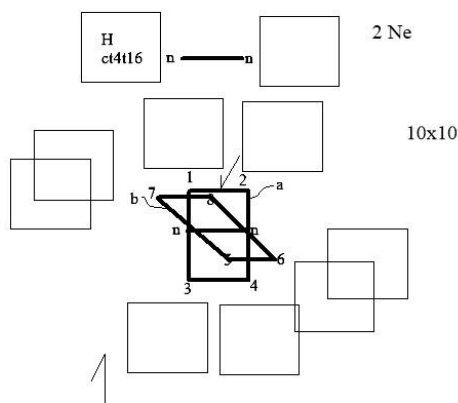

Figure 33b: Shows the structural concept applied to Neon, the next stable structure where helium defines an orbit around the otherwise fractal stable ct5t-1/10 (the first information arm t1 and the 10 (5 matched) neutron core states representing ct5T1. There are 2^3 (8) matched ct4 states forming a fractal around the neutron core plus the 2 from helium.

The photon fractal shown is surrounded by an electron fractal which, in turn, is surrounded by a photon fractal and reactions begin by the interaction of the outermost fractal states.
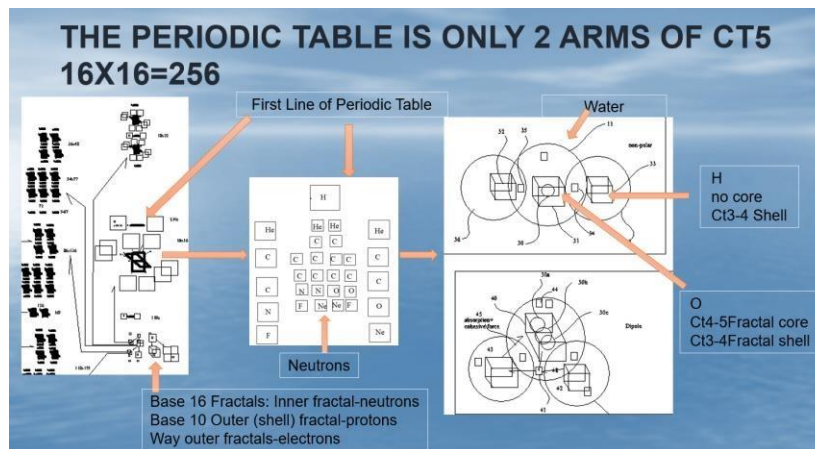
Applying the fractal geometry of the universe you have base 10 and base 16 fractals based on compression where the neutrons form an inner fractal around which the larger dimensional protons form an outer fractal. Hydrogen, not being a true part of the periodic table (being a pure ct3-4 state instead of a hybrid ct4-ct5 state) does not have the inner core. A longer discussion can be found in Algorithm Universe Model. A more detailed discusion of Spew and Absorption along with explanatory tables for each state can be found in Algorithm Universe Model.

Resulting Conclusions

AuT can explain:
1. How dimension arises from a non-dimensional framework. The expression of a mathematical fractal distorted by the underlying fused quantum information bits which have staggered life spans as positive or negative resulting in staggered compression and decompression alignment.
2. A definition of time. Change is quantum change, time reflects the effect of this quantum change on dimensions within a regional matrix at the place where there is enough information to give comparative results.
3. What the big bang was. The big bang is nothing more than an inflection point where the universe matrix (as opposed to a regional matrix) goes from net compression to net decompression. At the point of the big bang, the concentration of ct5-6 states was at its highest generating a more 5-dimensional universe which would look smaller and rounder than the current universe and would therefore match the big bang model in many respects although the entire universe would not be a point universe but would instead include all the various dimensional states.
4. When the universe will stop expanding and why. Based on calculations found in Book 1 of Algorithm Universe Theory, the universe will reach the next inflection point and begin contracting in approximately 7 billion years.
5. What forces are. Forces are net compression changes between dimensional states viewed from the perspective of time. This can be called changes in information arm loading over

values of x viewed from the perspective of time. Since compression and decompression co-exist, so do the forms of force, meaning we live in a net gravity environment filled with gravity and dark energy but primarily gravity. A detailed discussion can be found in Algorithm Universe Model.

6. Why force range is limited in some cases. Forces being tied to information arm loading and unloading are necessarily associated with narrow range of affected information arms. Since ct1,2 and 3 not subject to time or even dimension in the case of ct1 they appear to have a greater range in terms of arm loading or unloading. In fact, even gravity is limited in range because over large values of x net gravity changes for any ct2 state as it goes from compression to decompression.

7. What is dark energy? It is the opposite of gravity, net negative (decompression) solutions between ct2 and ct1.

8. Solutions to the paradox and the dual slip experiment and more theoretical explanations of exotics like dark matter and antimatter are suggested since changes occur independent of time.

Nomenclature

1. **X**-The count of the universe, counting in sequential quantum whole numbers (1,2,3, etc.). Each number represents a quantum instant for the entire universe.

2. **Quantum points, quantum data points**, -individual bits of fpix information which make up the universe. It is estimated there are at least 10^{100} of these defining everything from space to black holes. Each has a positive or negative charge for any value of x.

3. **Fuse, Transition Fuse (tf)**-the number of changes in x between charge changes (fpix progression) for quantum points. The direction of changes at the ct2-ct3 level is believed to be the source of traditional charge with observed electromagnetism being the effect of this charge when compressed at the ct4-5 level and with ct3 prephotons believed to carry electromagnetic charge within space as a result based on whether it is loading or unloading ct2.

4. **Fpix**-the denominator of pi and an equation that separates quantum points of the universe by transition fuses.

5. **F-series**-The Fibonacci series f(n); f-series compression refers to two times this number.

6. **Exponential compression** 2^n (see information arms).

7. **Place**-Also compression state: defined by the f-series raised to the exponential compression number which defines dimension and is also the numerator of pi for each compression state.

8. **Information arms**-the number of folds represented by exponential compression based on pairing positive and negative lower ct states.

9. **Transitional states**-compression states where the information arms are partially filled or separated by trapped states. Examples are waves, protons, electrons (ct3-ct4); molecules and post hydrogen atoms (ct4-ct5). Transitional states can be described as the transition between a lower state and a higher state. A ct3-ct4 transitional state, such as the electron and proton, are transitional states between waves and neutrons with too many intervening lower ct states to fully collapse into neutrons.

10. **Fractal States**: Stable mathematical structures for transitional solutions (theorized) and include photons, electrons and stable atomic states. These are generated by iterated functions.

11. **Hinge States**: mathematical solutions having bending solutions, theorized to be odd exponent solutions to compression equations based on $(2^n)-1$ exponents.
12. **Compression states**: mathematical solutions yielding compression theorized to be even exponent solutions based on 2^n exponents.
13. **Force**-Changes over values of x in the filling of information arms viewed from a timebased analysis. Electro-magnetism is theorized to be the loading and unloading of ct2 states onto ct3 information arms; gravity ct1 loading/unloading onto ct2 information arms. Since the net effect of time free changes is observed from a time-based perspective, we "see" these time independent changes as forces.
14. **Light speed**. The rate change represented by a single ct2 state relative to a ct3 state viewed from a time-based perspective.
15. **Time**: The ratio of ct1 states passing within a ct3-ct4-ct5 transitional state to ct1 states changing outside of the ct3-ct4-ct5 transitional state. This ratio is the source of velocity time dilation. The movement of ct1 states within the ct3-ct4 transitional state alter the arrangement of the ct3 wave states captured between the proton and the electron altering the history of points within the transitional state and the comparison of one collection of points to subsequent arrangements of the same points creates history.
16. **Electron Bundle**-The waves states within ct3-ct4 and ct4-ct5 transitional states which hold the history for a regional mass.
17. **Gravity**-the force created by non-dimensional ct1 solutions being "loaded" onto information arms of ct2.
18. **Dark Energy (anti-gravity)-**the force created by non-dimensional ct1 solutions being unloaded from information arms of ct2. This may include releasing ct1 states trapped within a higher ct state matrix.
19. Ct1-space defined by fpix sequential solutions.
20. Ct2-precharge: The first compression state, unique as coming from a non-dimensional state to a one-dimensional state. Note that the transition between ct1, ct2 and ct3 occur below the level of time and the transitions are therefore partially hidden from a time-based analysis.
21. Ct3-prephotons.
22. Ct4-neutrons-Note that neutrons do not allow for significant passing of ct1 states within the ct4 state due to the compressed nature of the neutrons, so time does not exist within neutrons. The origin of ct3-ct4 waves and time which is the changes to wave forms over the ct4-5 matrix. Squeezing out the waves is the source of gravitational time dilation.
23. Ct5-black holes. Molecular states are ct4-ct5 transitional states.
24. Ct6 and beyond-theorized higher compression states that form when the total amount of information in the form of ct5 states is properly aligned and enough.
25. **The big bang:** A misnomer referring to the time when the collection of compression solutions of ct1 states into higher ct states went from a net positive compression state to a net negative decompressing state reflecting a greater release of ct1 states from higher states than the corresponding entrapment. We are approximately 13 billion years (13billionx10^{44} changes in x) from the latest inflection point and approximately 7 billion years from the next inflection point where the universe will begin to contract again based on observed ratios (book 1 Algorithm Universe Theory Compendium).

Author and Presentation Information

Please see the author's Amazon page at: https://www.amazon.com/author/frzmn and the author's Facebook page for more links and articles at https://www.facebook.com/frzmn1 or @frzmn1 from Facebook
Youtube Channel: www.youtube.com/channel/UCxK8BwhzafIi1Jd0yE8mQXQ

For speaking engagements, please write gmfpc1@gmail.com

BY GREG FRIEDLANDER

Peer Reviewed: Journal of Physical Mathematics October 24, 2018 (Vol 9 Issue 4). "Algorithm Model defining Dimensional Features."
Advances in Theoretical & Computational Physics, 2019 (pending publication) space as energy – The underlying structure of the observed universe.

Other Publications:
Friedlander (2018) Algorithm Universe Theory Compendium Volumes 1 and 2.
Algorithm Universe Model Vol 1
A new theory of Quantum Mechanics developed between 2012 and 2018. The footprints of the creation of the universe are fossilized within the math we use to interpret the universe. This model unpacks those footprints and lays out the function of the universe below the level of thermodynamics, dimension and time.
Friedlander, Algorithm Universe Model, 2nd edition, (2019) algorithm Universe Audio.
Friedlander (2013-2018) ALGORITHM UNIVERSE THEORY BOOKs 1-8
Friedlander (2017) Book 1, 2nd ed: An Overview of the origin of space time and quantum phenomena
Friedlander (2017) Book 2, 2nd ed: The origin of space time and quantum phenomena
Friedlander (2018) Book 3, 5th ed: Mathematical Proofs of Supersymmetry
Friedlander (2018) Book 4, 4th: Transition from non-dimensional phenomena to space time
Friedlander (2018) Book 5, 2nd ed: State Dimension and Time
Friedlander (2018) Book 6 Dimension, Time and logic
Friedlander (2018) Book 7 AuT and the Standard Model
Friedlander (2018) Book 8 AuT the nature of time as electron movement
Friedlander (2016) SPIRALS IN AMBER, SECOND EDITION-The single variable solution to the universe and the origin of quantum mechanics
Friedlander (2016) A Spiral in Amber-The origin of Quantum Mechanics
Friedlander (2014) Non-linear time theory, successor to the Einstein Hologram Universe (out of print)

Conferences: Friedlander (2018) conference on Astrophysics and Particle Physics in Chicago, A model for generating dimension and time
Colloquium Speaker (2019) University of South Alabama: This article
Friedlander (2019) APS April Meeting, Algorithm Universe Model for generating Dimensional Features http://meetings.aps.org/Meeting/APR19/Session/Z08.3
Legal: www.gmfpc.com