

The mathematics of zero-dimensional space

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Abstract: Examined here is zero-dimensional space, or more simply the mathematics and physics of a “point”. Here, it is considered that there has been a great oversight in physics modelling regarding the mathematics and physics of a point, so much so an anomaly has developed in the current Λ CDM model owing to the oversight. This oversight and associated anomaly shall be identified and rectified in the current Λ CDM model, thence proposing an upgraded cosmological model that can better account for the oversight and associated cosmological anomaly. The conclusion here is that the next step to the Λ CDM model is a new cosmological model prescribing the mathematics of zero-dimensional space, which then readjusts the Λ CDM model, proposing a more complete pan-phenomena and pan-data model for cosmology.

Keywords: zero-dimension; Λ CDM; time; space; temporal mechanics

1. Introduction

Physics, in developing models of physical phenomena, requires, develops, and enacts a standardised form of measurements and definitions; for phenomenon A and phenomenon B to be related, they need the same standards of measurements to define them, the same “realm” of measurement basis. Mathematics is the tool of measurement used.

The measurements usually rely on a point-reference (zero-dimensional) circumscribing physical phenomena, either as a point reference in space or a point reference in time, usually both. A point

reference of space to another point reference of space leads to the idea of a line, as one dimension, and thence two and three dimensions. A point reference in time is generally scaled to an arrow of time moving through the datum reference of time-now as a flow from time-before to time-after via time-now. This one dimensional idea of time has been associated to 3d space as 4d spacetime according to Einstein's works of special and general relativity. The idea of time was then used in an action principle Lagrangian time-domain deriving a sequence of events for time pointing to the value 0 in 3d space, such in describing a momentary event in time and thus presumably an instantaneous location.

Subsequent to all of such has developed a standard metric system of measurements for physical phenomena. All of such, in being applied to observations and measurements of physical phenomena, has pointed to the Λ CDM model, the big bang model, where there was a point in time where space and time came into existence, a beginning, where time started ticking (so to speak) and space as a metric began expanding from nothing, and everything therein came into existence.

In other words, the modelling process from any "point" in spacetime (in *assuming* this point as an infinitesimal zero-dimensional space and time construct, as a point) has everything lead to the beginning of all such as a point, namely the moment before the big bang event as a singular infinitesimal zero-dimensional reference. To note though is that ahead of the shock front of space as it metrically expands, of the big bang, is still a zero-dimensionality of space and time, and thus also a "point", yet here the idea of an infinite super-massive point, creating a type of point-paradox between the pre big bang *infinitesimally-sized* point and the post big bang *infinitely-sized* point.

Therefore, if anything, the entire system of physics has reached its completeness in using the assumption of a "point" to derive the *beginning* of reality as a theory of cosmology from an infinitesimal zero-dimensional construct (as a point, as the condition preceding the big bang) together with what exists *beyond* the outer reaches of everything still presumably expanding, namely that which can only somehow also be *a point* albeit an infinite zero-dimensional construct. Consider this infinitesimal-infinite zero-dimension paradox as the Λ CDM zero-dimension paradox.

On top of this, the other problem found with the Λ CDM system is the energy needed for the big bang and how the perceived phenomena of galaxies can be explained in that metric expansion of space context without those stars of those galaxies flying apart, leading to the requirements of dark energy and dark matter respectively, signifying the name Λ CDM which comes from the required notions of dark energy (Λ) and cold dark matter (CDM), concepts that are nonetheless "dark" because there is no direct phenomenal evidence for them.

In other words, although the entire 4d Λ CDM system seems understandable, there is an issue with zero-dimensionality (Λ CDM zero-dimension paradox), energy (required for the redshift phenomena and thus presumably expansion of space), and mass-gravity (required to keep the phenomena of galaxies together).

To resolve these issues one could ask if the idea of time and space were incorrectly joined as Einstein's *spacetime*, technically the basis for the Λ CDM model (more so than classical and quantum mechanics). Yet Einstein's *spacetime* theory has predicted the phenomenon of black holes, time-dilation,

time-contraction, to name a few. Perhaps Einstein's spacetime theory is incomplete, or that it only as a full theory describes a portion of reality?

The question asked here is regarding the completeness of the Λ CDM model and its conclusions, namely the requirement for dark energy and dark matter (both of which as phenomena have yet to be found, only *inferred*, hence them being termed "dark") and the Λ CDM zero-dimension paradox issue. Indeed, there could be another mechanism in play that can explain the redshift galactic phenomena, and thus not need a metric expansion of space and thence not need a big bang start date and thence not need the paradox of an infinitesimal beginning point and a supermassive infinite point ahead of the metric expansion of space.

It is proposed therefore that to find the real issue with the Λ CDM scheme is to examine the idea of a "point" and then make a required amendment to the Λ CDM cosmological model, even if such means abandoning the ideas of dark energy and dark matter, and thus proposing a new cosmological model.

Here the proposal is to take into consideration all the features of the zero-dimensional aspects of the big bang model (Λ CDM), acknowledge the merit there of what it the Λ CDM model has achieved, yet consider that such a model is not complete owing to the following:

- the Λ CDM model not addressing the mathematics of the zero-dimension,
- and that the ideas of dark energy and dark matter are yet to be resolved.

There are three other known key issues regarding astrophysical data in the context of the Λ CDM model, namely:

- the Flatness problem,
- the Horizon problem,
- and the "Axis of evil" problem.

These last three issue prescribe that:

- the measurement constants known in the point-reference spacetime model are relatively fixed (flatness problem) and thus highly dependent on a fundamental origin/basis code for time and space,
- and how such pervades through "all" the regions of observed astrophysical phenomena (horizon problem),
- yet how all of such has the solar system appear to be the centre of the universe (axis of evil problem), namely the phenomenally apparent correlation between the plane of the solar system and the registered aspects of the CMBR.

The question therefore is how to define zero-dimensional time and space to resolve these issues.

2. Zero-dimension *reference*

Regarding the Λ CDM zero-dimension paradox, in considering the *infinite* zero-dimensional (time and space) point reference, and *not* the pre big bang *infinitesimal* zero-dimensional (time and space) point reference, paradoxically with the Λ CDM model all of time and space and its dimensions can exist *within* the *infinite* zero-dimension of time and space realm ahead of the big bang shock front. How does the concept of time therefore relate as a scale in between the infinitesimal and infinite zero-dimension realms if an infinitesimal zero-dimension “point” is in fact a useful if not necessary concept to mathematical physics in explaining non-zero dimensional physical phenomena?

To resolve this issue, let us consider the infinitesimal and infinite zero-dimension realms as *one*, here proposed as \odot_0^∞ , a symbol of a point surrounded by a circle in between and including the mathematical scales of zero to infinity.

The proposed way to develop non-zero dimensions for time and space is to ask two key questions:

- “how can zero-dimensionality hold non-zero dimensionality within it, namely can that something that exists beyond time and space actually represent an infinite realm that holds a measurable and physical reality within it, and why”,
- and “how can that reality within that infinite zero-dimensionality define itself thence?”.

The solution here to addressing these questions is that there is only one way to explain reality, and that is getting the *reference* correct, and the proposal here to such is by labelling this entire scheme (\odot_0^∞) mathematically as a unit reference; the proposal here is to consider a *continuum between* the *infinitesimal* zero-dimension reference (for time and space) and the *infinite* zero-dimension reference (for time and space), thus resolving, as a proposal, the Λ CDM zero-dimension paradox.

Consider this proposed *model* as the \odot_0^∞ model.

Here, the \odot_0^∞ model can be defined as infinitely expansive as possible, yet if it were required to find an infinitesimal zero-dimensional reference in that infinite zero-dimensional \odot_0^∞ realm, a core infinitesimal point in that infinity, how would it be done?

The proposed process involves nominating that the entire \odot_0^∞ realm represents a moment in time, a singular moment in time, as the datum-reference of time-now, as much as a moment in time has always existed *between* the *infinitesimal* zero-dimensional pre big bang event (the moment of the big bang) and the *infinite* zero-dimensional shock-front ahead of the metric expansion of space.

Here time cannot be as “0” yet must represent a value, say the value of time-now (the moment) equals the value of 1 as say $t_N = 1$.

As a point structure of this \mathcal{O}_0^∞ realm, a hypothetical infinitesimal *time-point* is proposed to exist anywhere and everywhere in the \mathcal{O}_0^∞ realm such that there is an infinite amount of infinitesimal $t_N = 1$ time-points in this \mathcal{O}_0^∞ realm.

Simply, time here as a time-point bearing reference to another time-point is still a moment in time.

What separates these time-points though if they each represent the idea of $t_N = 1$?

Mathematically, “nothing”, 0 exists between each time point.

Now consider space.

The proposal here is that the “thing” between one time point to another is 0-space, as much as the difference between $t_N = 1$ to $t_N = 1$ is 0, which is fine as a mathematical value, namely $1 - 1 = 0$.

The proposal here is that space is this “0” value, this “thing”, that exists between the time-points.

So, with one time-point defined as “1” and another time-point defined as “1”, space here is going to be considered as the ultimate 0-space backdrop.

In short, here, $t_N = 1$ implies that for every infinitesimal reference in the proposed \mathcal{O}_0^∞ realm time is as a moment as though there is a universal moment entanglement of $t_N = 1$ infinitely everywhere in the \mathcal{O}_0^∞ realm, and that separating the time-points is the idea of 0-space.

Now the question arises how time and space can develop as dimensions and not infinitesimal zero-dimensional point-analogues, namely how can an infinitesimal point in time and space be *located/positioned* in reference to another infinitesimal point in the context of this entire infinite datum-reference of $t_N = 1$?

3. Zero-dimension *position*

Here the idea of *position* enters the \mathcal{O}_0^∞ realm, which requires bearing reference from one 0-space point to another 0-space point as an altogether new event, as a spatial *dimensional* event, namely the spatial position of a nominated object/event in the \mathcal{O}_0^∞ time-now ($t_N = 1$) realm compared to another 0-space reference point.

Time here though as an infinitesimal time-point ($t_N = 1$) bearing reference to another infinitesimal time-point ($t_N = 1$) is still a moment in time.

Therefore, in order to generate dimensionality for space as distance, time must develop as a dimensional entity from its $t_N = 1$ status in order for space to also develop as a dimensional entity. The question is how.

The proposal here is creating two new temporal “positions” as *time-before* and *time-after* in regard to time-now ($t_N = 1$).

Why? Time-now must be time-now by definition of the general infinitesimal and infinite zero-dimensional reference realm (\mathcal{O}_0^∞), as a universal moment, and so to create another infinitesimal time-now is to herald back to the reference, which can’t be done as a new step, and so a new concept of a

position of time relative to time-now must be created, and here is the concept of *time-after* as a new reference of time, say t_A , *time-after* being that step *beyond* time-now.

What is the position of time-after? The position of time-after is proposed to be *unknown*, as much as space is still 0-space and the reference grid is still indeterminant other than space being a 0-space non-dimensional point reference in the context of time-points all equating to "1" everywhere as a moment.

Thus, as a proposal thus far, $t_N = 1$, and $t_A = ?$.

To say though there is a *time-after* event is to imply a time-before event relative to $t_N = 1$, and thus there must be a *time-before* event also, somehow, say as t_B .

Thus, there would be three features for time, time-now (t_N), time-after (t_A), and time-before (t_B).

The proposal is that time-now (t_N) in alliance with this potential time-before (t_B , whatever value it is, a value that must be certain if time-after is uncertain) results in this unknown time-after (t_A).

The solution proposed here is that t_B in regard to t_N requires a negative sign for t_B (equation 1) given t_B would be a "backward/negative" step in reference to t_N if indeed time-after is a forward step ahead of time-now, namely t_B as a "before" concept in regard to $t_N = 1$. Thus, the following equation would suffice:

$$(-t_B) + 1(t_N) = \text{fundamental property A} \quad (1.)$$

Yet, if time as $t_N = 1$ is the time-now basis, as a systemic basis, we can present the case that t_N can also be per " $-t_B$ " as another equation, as technically t_B would already be positioned *within* the $t_N = 1$ reference, as it would have already happened. Thus the following equation would suffice:

$$\frac{1(t_N)}{(-t_B)} = \text{fundamental property B} \quad (2.)$$

Thus, if these two equations represent fundamental properties of time, and time itself is being defined as a systemic $t_N = 1$ realm, then fundamental property A must equate to fundamental property B, as follows:

$$(-t_B) + 1(t_N) = \frac{1(t_N)}{(-t_B)} \quad (3.)$$

From equation 3, we arrive at the following:

$$t_B^2 - t_B = 1(t_N) \quad (4.)$$

$$t_B + 1(t_N) = t_B^2 \quad (5.)$$

Given there are only 3 proposed concepts for time, namely t_B , t_N , and t_A , then t_B^2 must be equivalent to t_A , and thus we arrive at the following:

$$t_B + 1(t_N) = t_A \quad (6.)$$

Such (eq.6) is the proposed time-equation, noting that the solution to equation 5 as t_B is φ and $\frac{-1}{\varphi}$, the golden ratio.

These two values as the golden ratio are now proposed to function as two distinct references for time which can thence be used to formulate *spatial dimensionality*.

To now work with these features, let us take two Pythagorean algebraic vectors for t_B , one as φ the other as $\frac{-1}{\varphi}$ (fig. 1.) arriving at equation 7 (fig 2.):

$$\left(\frac{-1}{\varphi}\right)^2 + \varphi^2 \cong 3 \quad (7.)$$

How this “3” value manifests as *spatial dimensionality* is proposed to be how space is incorporated with time-now ($t_N = 1$) as a dimensional entity, namely 3d space in a universal time-now $t_N = 1$ event, as per figure 3:

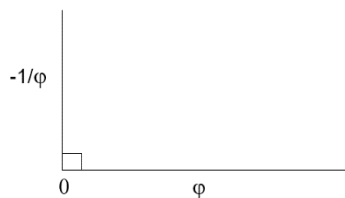


Figure 1: two lengths of time, $\frac{-1}{\varphi}$ and φ ,

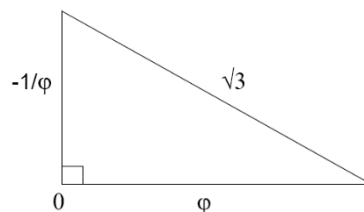


Figure 2: two length of time, $\frac{-1}{\varphi}$ and φ , which then result in the value of $\sim \sqrt{3}$ (Pythagorean relationship).

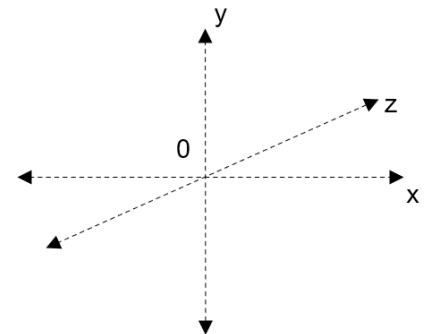


Figure 3: 3d *timespace*

Here the proposal is that this “3” value represents a 3d vector grid as the 3 dimensions of 0-space (fig. 3) with an accompanying time component, as $3 \cdot t_N$, and thus the dimensional definition of a 3d spatial position in regard to $t_N = 1$ proposed here as a 3d *timespace* grid.

The next question is, “how does this 3d *timespace* grid work?”.

4. Zero-dimension *processes*

The previous sections are an account of the basis of Temporal Mechanics [1-42], specifically papers 1-2 [1-2]. The process of Temporal Mechanics in paper 1 [1] began without full foresight of what

lay ahead, and as such in having derived the time-equation the process was one of applying the time-equation to basic geometric ideas of time and space, then to the basic equations of gravity and EM , and then the basic idea of an atom and associated electron shell system.

Temporal Mechanics then moved to developing how the time-equation could construct 3d space as a temporal wave function (as 3d *timespace*), as per paper 2 [2], as presented here in the previous section.

From paper 2 page 6 ([2]: p6) onwards is the process of how the time-equation and its golden ratio features relate to 3d space as 3d *timespace*, deriving a temporal wave function (as the analogue for EM) and thence deriving the fine structure constant ([2]: p15), a value subsequently refined in paper 39 ([39]: p46-52), thence derived more fundamentally still from the primary temporal wave function in paper 41 ([41]: p33). There in paper 2 ([2]: p15-16) is also derived the value of c in using the known scales of the Bohr radius (a^0) and electron charge (e_c).

Thence, namely from paper 2 [2], the process was one of taking those findings and comparing them to known features of physics theory, to thence develop a core underlying basis for the field forces and associated phenomenal activity.

Through this entire process, *timespace* became integral to the physical constants and their associated dynamic equations of force and location; defining "1" for *time-now* as $t_N = 1$ is basically stating "1" as a factor can apply to anything, namely *time-before* or *time-after*, as though there is that intrinsic loop of *time-now* to any potential event that has happened (*time-before*) or will happen (*time-after*). Paper 40 ([40]: p9-19) explained this process in comparison to the Lagrangian process.

Ultimately, the dimensional limit of this *timespace* was established in understanding how the temporal wave function (EM) courses through space, and what limit the temporal wave function finds with its energy value and why, and how that is central to an isotropic $CMBR$, accurately derived at $2.725 K$ and $10^{-9} Jm^{-3}$ ([14]: p22-25).

The general process with Temporal Mechanics is one of *timespace* calculation, modelling, and testing/comparing with known data, leading to the cosmological model proposed throughout paper 42 [42]. By this process, new discoveries have been made, namely:

- The value for G (gravitational constant) being primarily equitable to the mass of the neutrino (accurately derived), such in association with two new phenomena reveals, namely an electron degeneracy process revealing the phenomena of the stars, and the EM_X^{DIR} field effect revealing the phenomena of black holes [42].
- Gravity is thus a sub-quantum phenomenon which ultimately approaches a "0" value for energy and temperature as a force field effect, such from the basic underlying mass of the neutrino and that associated sub-quantum derived temperature value.
- *Timespace* has energy, as an $EM CMBR$ radiation, and gravity uses such on a sub-quantum level via a temperature scale, dispelling the idea of quantum gravity.

- In *timespace* being developed from a geometric (Pythagorean algebraic) time-equation, such leads to a negative energy value for gravity in that temporal wave function derived energy value of space.
- There is a baseline field force in play, a flatline *EM* field (and thus 0 value) proposed as the EM_X^{DIR} field as one that brings into effect the idea of entanglement for both *EM* and gravitational processes; the feature to this EM_X^{DIR} field is that it is non-inertial and resists *EM* and gravity, meaning that this EM_X^{DIR} field in being demonstrated in a laboratory can repel *EM* and *G* and thus be central to non-inertial propulsion systems.
- A new cosmological model is formulated as presented in paper 42 (cosmological principles 1-9) detailing what is required to understand astrophysical phenomena, namely the scale of stars at play according to this newfound electron degeneracy process and associated EM_X^{DIR} field effects [42].

Here in this paper is a re-analysis of how the current model of physics and cosmology can make this next step of discovery as a logical next step, what that next step is, and why it should be made.

5. Conclusion

In considering the zero-dimensional results of the Λ CDM model, namely the infinitesimal zero-dimension pre big bang condition and the associated infinite zero-dimension in front of the big bang shock front, a paradox given zero-dimensional mathematics (as point references) is used to model phenomena in the non-zero dimensions of time and space, Temporal Mechanics has shown that the non-zero dimensional system of time and space is not a result of a big bang, yet is in a perpetual *steady state* status according to a time equation deriving 3d space as *timespace*, as a temporal wave function. Further to such, Temporal Mechanics has shown that there is a spatial limit to that steady state system in being bound within a perimeter beyond which is an infinite zero-dimension void of time and space, a zero-dimensional realm which itself *repels* being penetrated and thus keeps non-zero dimensionality within it.

Conflicts of Interest

The author declares no conflicts of interest; this has been an entirely self-funded independent project.

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For ease of search functionality, the complete PDF of Temporal Mechanics containing all its current papers is available from the following link (Non Open Access):

<https://transactions.sendowl.com/products/78257031/AE5EA60A/view>

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