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# Useless Math – The Complex Untold Story

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**Abstract**

- ***If you don't understand mathematics, ask yourself if I'm right, because others don't understand mathematics either.***

**By useless mathematics we mean incomplete mathematical spaces of a classical 3D+t variety that are inadequate for generating well-defined definitions and hypotheses as well as time-dependent partial differential equations. The current classical discrete 3D+t space PDE, in which time is an external controller and not integrated into the 3D geometric space, cannot be integrated digitally. This space is logically incomplete and misleading in the production of definitions and hypotheses as well as in the resolution itself of time-dependent PDEs. No wonder these definitions/assumptions are ugly and result in weak or intractable mathematics, leading to all kinds of misunderstandings, from horrible notations to undisciplined length of theorems containing a considerable amount of black magic and ending with a gray nature of the mathematical result obtained. In this article we present some of the most catastrophic inaccurate assumptions existing in current classical mathematics, resulting from the use of 3D+t manifold space to specify initial conditions, boundary conditions and the source/sink term. Fortunately, these inaccurate assumptions that start with an ugly space for boundary conditions, initial conditions and source/sink term can be spotted and analyzed via 4D unitary numerical statistical theory called Cairo techniques in the format of transition chains of matrix B to complete what is missing. In other words, we present how to spot some of the ugliest mathematical conclusions of classical 3D geometry plus t as an external control numerical space, and then show how to correct them via the 4D unit space of statistical transition matrix chains.**

**By complex and untold history, we mean that useless and misleading mathematics dominated scientific research and education throughout the 20th century, so much so that the accumulated legacy of misconceptions became a huge, complex mountain, almost impossible to eliminate.**

**Fortunately, the numerical theory of Cairo techniques and the Laplacian theorem constitute an advanced and exhaustive form of the energy continuity equation and thus can create new logical mathematics.**

**This is also the case of the famous Schrödinger time-dependent PDE.**

- ***The Laplacian theorem is one of the most important products created by the numerical statistical theory called Cairo techniques.***

**In previous articles we introduced and briefly explained the so-called Laplacian theorem in the 4D x-t unit space, while in this article we highlight its importance and how it can generate new mathematics in more detail.**

**The Laplacian partial differential equation that interests us is the one having a well-defined exclusive form and living in an isolated sample spatial control volume surrounded by a closed surface (A) and subject to Dirichlet boundary conditions.**

**This very particular case of Laplacian PDE is always treated mathematically in a classical D^4 variety which is lazy and misleading.**

**Finally, this article collects, studies, identifies and analyzes the dozen most common current useless mathematical events and presents an effective and adequate alternative.**

## I. INTRODUCTION

**If you don't understand mathematics, ask yourself if I'm right, because others don't understand mathematics either.**

In order to better the world, mathematics has to better itself.

The main reason is that mathematics, theoretical physics and quantum physics are not understandable by themselves in their current format.

Ideally speaking, mathematics should be a science full of logic and beauty, it is not only an abstract theoretical system of axioms and proofs achieving a kind of luxury, but it also plays a vital role in our daily life and in the thought and perception operations of our brain.

Unfortunately, during the 20th century, tons of useless and misleading mathematics entered and stabilized in this science.

Through this article, we will explore and rectify some fundamental illogical concepts of mathematics that can demolish its beauty and correctness.

We introduce the Laplacian theorem for a control volume space and relate it to the statistical theory of Cairo techniques. These two forms are an advanced and comprehensive format of the energy continuity equation, can rectify and create new mathematics.

It is now clear that the term useless mathematics refers to incomplete mathematical spaces and rules of a classical 3D+t variety that have entered and stabilized in mathematical science, even though they are misleading and inadequate for generating definitions and well-defined hypotheses. The same applies to all kinds of time-dependent partial differential equations.

We hope that the current useless mathematics in 3D + external t will gradually be replaced by adequate mathematics in 4D unit space.

The Laplacian theorem itself, which is a particular product of the Cairo theory of techniques in 4D unit space, is not entirely new.

In a previous article [1,2,3], we presented and briefly explained the so-called Laplacian theorem in the 4D x-t unit space and highlighted its importance and how it can generate new mathematics.

The Laplacian partial differential equation (not to be confused with Laplace's PDE ∇^2. Ves=0) which interests us is the one describing the energy density field U(x,y,z,t) in an isolated sample spatial control volume (V) surrounded by a closed surface (A) and subjected to Dirichlet boundary conditions.

The Laplacian equation has three equivalent formats,

dU/dt)partial = α ∇^2 (U) + S. . . . ……………………… (1)

Subject to Dirichlet boundary conditions.

U(x,y,z,t+dt) = B. U(x,y,z,t) . . . . . ………………………(2)

And,

U(x,y,z,t)= D(N) . (b+S) + IC. B^N. . . . . …………………(3)

Or,

U (x,y,z,t) is the energy density J m^-3 and α is the diffusivity of the energy density m^2 s^-1 of the medium in which the energy density field U lives and functions.

The Laplacian operator ∇^2 is mathematically defined in 3D geometric space as the combination div grad, (∇.∇) or ∇^2 which is called the mathematical "Laplacian" and, ∇^2. U in equation 1 is the physical Laplacian operator in 4D unit space operating on the energy density field U(x,y,z,t).

S is the energy density source/sink term expressed in units of energy density per unit time.

***So-called Laplacian systems are those described by PDE 1 or recurrence relation 2 or solution equation 3 and are subject to their own particular rules.***

***The Laplacian theorem is the particular rules and assumptions used to solve the Laplacian PDE itself and further generates additional mathematical and physical rules and assumptions which are the subject of this article.***

This very special case of equation 1 is still treated mathematically in a classical way via 3D geometric space plus external time [4,5] which is lazy and misleading.

The efficient treatment of the Laplacian PDE with Dirichlet boundary conditions is rather a physico-mathematical treatment using its natural physical properties described by the Laplacian theorem.

The importance of Laplacian PDE comes from its vast existence almost everywhere in classical physics like audio room theory, thermal diffusion, electrostatic potential boundary value problems, heat diffusion PDE, etc., as well as quantum physics in Schrödinger's PDE.

Let us recall the considerable success of the Schrödinger partial differential equation (which is in a way the SQRT of the Laplacian PDE) and of quantum theory as a whole where it also relies on an advanced and exhaustive form of the energy continuity equation which is analogous to that of the energy continuity equation proposed in Laplacian mathematics.

Note again that the Laplacian process or the Laplacian system itself can be described or defined via three equivalent formats,

*1-It is defined by PDE 1.

If and only if.

[Which means that the space-time process is called Laplacian if and only if it can be described by PDE 1].

*2-The spatio-temporal evolution of the Laplacian process is described by the recurrence relation,

U(x,y,z,t+dt) = B. U(x,y,z,t) . . . . . . ………………………(2)

if and only if.

Where B is the well-defined statistical transition matrix [6,7,8,9].

We can show that there exists a transfer matrix D(N) given by,

D(N)=B+B^2+B^3+. . +B^N. . . ……………………….... (3)

Note that for N sufficiently large, we arrive at the steady-state time-independent solution given by,

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D(N)= [1/(I-B)] – I . . . ……………………………………(4)

Or,

D(N)=E-I. . . . . ……………………………………………(5)

Where E is the related transfer matrix expressed by the infinite integer series matrix:

E=B^0+B+B^2+B^3+. . +B^N. . . . …………………… (6)

Obviously,

B^0 =I

And

B^N tends to zero when N tends to infinity since the norm of B is less than 1.

*3- Finally the Laplacian process can also be defined as that having the spatio-temporal solution,

U(x,y,z,t)= D(N) . (b+S) + IC. B^N. . . . …………………...(7)

**If and only if.**

***Equation 7 shows that there is some sort of inherent classical energy entanglement between free nodes and walls.***

***This inherent classical energy entanglement goes from walls to free nodes and back with the speed of sound Vs = 330 ms^-1 or of light c = 3E8 m s^-1 as explained in more detail in Q/A 5.***

Or,

b is the vector of Dirichlet boundary conditions arranged in the correct order.

IC is the vector of initial conditions.

IC (x,y,z)=U (x,y,z,0) . . . . ………………………………. (8)

N is the number of iterations or time steps of dt not to be confused with the number of free nodes n.

Note that the above three descriptions or definitions for the Laplacian system are one and the same but in a different format.

***The recurrence relation of equation 2 defines the strings of matrix B.***

***B transition matrix chains are the only statistical transition matrix known today apart from the Markov transition matrix.***

However, Markov chains are a pure mathematical model used to represent a process of isolated and stochastic nature, which has no place for the source term S or boundary conditions b.

Equation 7 shows that all states of Laplacian systems are entangled with its boundary conditions in 4D space, x, y, z, t and that their states cannot be separated from the state of their boundary conditions.

Note again that the above definition of three necessary and sufficient conditions for equations 1,2,3, if and only if, does not exceed the definition, because all three are the same thing.

If we assume that the universe is made up of space and time where waves, matter and energy density live and operate, then the hypothesis of Laplacian fields that fill all space and time can support the element of reality of a Laplacian mechanics.

There are tons of intuitive and brilliant resources in the computing power of a discrete closed numerical system such as the Laplacian system.

The following corollaries of Laplacian's theorem are true for any control volume V:

- *Corollary 1,*

  *For an isolated system of U(x,y,z,t) without an energy source in a 3D geometric volume of the sample space delimited by a closed surface A and subject to Dirichlet boundary conditions, its equilibrium state stationary is reached if and only if ∇2 U(x,y,z)=0 everywhere.*

  *It is clear that this corollary is a consequence of equation 1.*

- *Corollary 2,*

  *The volume integral of $\nabla^2$ U(x,y,z,t) over the closed volume V for any source/sink distribution inside V is equal to the closed surface integral of U.**C**.*

  It is clear that **C** is the speed of the wave in the medium considered.

C= 330 m $s^{-1}$ for the sound wave and 3E8 m $s^{-1}$ for EMW.

In mathematical language,

$$\iiint_{\text{closed volume}} \nabla^2 U(x,y,z,t)\ dV = \iint_{\text{closed surface}} U(x,y,z,t).C\ dA \quad (9)$$

Note that in equation 9 which is is the Laplacian corollary 2 in integral form you can substitute ∇2 U(x,y,z,t) = -S(x,y,z,t) to obtain, $\iiint_{\text{closed volume}} S(x,y,z,t)\ dV = \iint_{\text{closed surface}} U(x,y,z,t).C\ dA$ . . (10)

*We believe that Corollary 2 is the source of all evil if broken and the source of all good if respected.*

*Corollary 2 is the general principle of conservation of energy in its best form.*

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In order not to worry too much about the details of the introductory rules and assumptions, let's move directly to the theory and its numerical results.

## II. THEORY AND NUMERICAL RESULTS

Throughout this section of Theory and Numerical Results, we present a question-and-answer approach that reveals and adjusts the top 12 current useless and misleading mathematical claims in different areas of theoretical physics, quantum physics, and mathematics.

### *A. Q/A 1*

- *How is the Laplacian PDE solved in the modern Laplacian theorem?*

In other words, compare the improved technique with the current classical solution for Laplacian PDE.

*Science leaves the era of mathematics and enters the era of matrix mechanics and the turning point is the discovery of numerical statistical theory called Cairo techniques and its transition matrices eligible to solve almost all problems of classical physics and of quantum mechanics.*

*No more partial differential equations (including the Laplacian PDE which only serves as a support for testing and comparing the numerical results of the chains of matrix B.), no more numerical integration, no more FDM techniques. . etc.*

*Statistical matrix mechanics is capable of solving all of the above problems and additionally predicting unknown universal physical and mathematical rules.*

Note that ***the Heisenberg matrix and the Dirac matrix are neither physical nor statistical and therefore incomplete.***

Once again, the Laplacian PDE is always treated mathematically through a classical mathematical spatial solution (3D geometry + external t) which is tedious and its existence, uniqueness and convergence are not always assured [4,5].

In more detail, the classical mathematical process for numerically solving Laplacian PDEs consists of advancing via the following procedure in three consecutive steps [4,5]:

- Start by discretizing the 1D, 2D or 3D sample space into n equidistant free nodes,
- Then treat the partial differential operator ∇2 by the method of finite difference techniques FDM which generates n non-homogeneous algebraic equations of the first order in matrix form and finally,
- Solve the n first order algebraic equations resulting from step 2 by matrix inversion or any other practical iteration method.

The numerical solution of step 3 is quite difficult to obtain since the underlying matrix A is singular.

In mathematical language, the three-step procedure above results in a system of n first-order algebraic equations in matrix form [7,8,9] expressed as follows:

$$A\,U = b \quad \ldots\ldots (11)$$

Where $A_{nxn}$ is the so-called Laplacian matrix and b is the vector of boundary conditions arranged in proper order.

Which means that the solution of PDE 1 is,

$$U=A^{-1}\,.\;b \quad \ldots\ldots (12)$$

Obtaining the solution of n first order algebraic equations from equation 11 via equation 12 is quite difficult since the underlying matrix (A) is singular.

We'd better look for a stable and practical iteration method [6,7,8,9] in a revolutionary technique which we call the Cairo techniques.

***We propose the following alternative statistical technique, based on B-matrix chains, which are a product of the Cairo techniques.***

This technique is valid for Laplacian PDE in Laplacian system.

This technique completely neglects partial differential equation 1 as if it never existed [1,2,6].

The numerical results of the proposed numerical statistical techniques show the uniqueness, stability, accuracy and superiority over conventional PDE solution methods.

The core of the revolutionary B-matrix chain techniques is to reformulate the Laplacian matrix A in statistical form as the transition matrix B which we now call A*.

Numerical solution of equation 1 reduces to,

$$U(x,y,z,t)= D(N)\,.\,(b+S) + IC.\; B^{\wedge}N. \;.\;.\;.\;.\; (13)$$

Note again that equation 13 neglects PDE 1 as if it never existed [1,2,3,6].

We emphasize again that the numerical statistical chains of matrix B are the correct solution of the Laplacian PDE which bypasses the PDE itself and its numerical calculation methods such as FDM.

Note also that in the above formulas used in the theory of Cairo techniques and Laplace's theorem, it suffices to find the well-defined statistical transition matrix B[1,2,3,6] then one of its derivative matrices of transfer such as D and E follows from expressions 4,5,6 without it being necessary to invert the Laplacian matrix A.

Additionally, FDM techniques or any other mathematical aids such as MATLAB are not required.

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We actually replaced equation 1 with its statistical equivalence via the well-defined transition matrix chains B [6].

It goes without saying that the proposed statistical solution is far superior to the classic and tedious PDE solution.

***Cairo techniques and Laplacian theorem can create new mathematics, unlike useless classical mathematics.***

*B. Q/A 2*

- *Is there a so-called statistical proof or statistical refutation of a certain hypothesis?*

- *In other words, what do you mean by statistical evidence never mentioned before?*

It is worth mentioning that the Laplacian theorem and B-matrix statistical techniques are based on four universal statistical assumptions, each of which constitutes in itself a universal law or universal rule [1,2,3,6 ].

It is therefore logical to assume that Laplacian's theorem and statistical transition chains B for energy density U are universally true.

***Its numerical calculation results for a given event are also universally true***.

In other words, ***we claim a so-called statistical proof which is the statistical solution derived from B-Transition-Matrix-Chains which has never existed before.***

Theoretical statistical proof should not be confused with experimental statistical proof based on random sampling from a relevant statistical population space of equally probable elements.

***It should be noted that experimental statistical evidence by sampling remains evidence whatever the sample size, while the theoretical statistical proof remains a proof even for a small number of free nodes n.***

We emphasize again that theoretical statistical proofs or inferences that have never been known before are now available via Laplacian theorem and B-Matrix techniques.

It follows that the number of proof approaches now increases from 2 to 3 to take into account the newly added statistical proof [9,10].

Now we get,

- Proof of theoretical physics or theoretical mathematics.
- Proof of measurements or experimental observations.
- The newly added statistical proof.

It is worth mentioning that ***the newly added statistical proof, which has never been found before, is created by the Laplacian theorem and the statistical chains of matrix B.***

***This is clearly a creation of new mathematics that is impossible to achieve via classical mathematics.***

*C. Q/A 3*

- *Can the Laplacian theorem and B matrix chains be applied in numerical statistical integration?*

Contributions of modern probability theory and statistics originating from B-matrix strings have exceptional applications in theoretical mathematics, physics, and computational calculus.

It is possible to calculate a finite numerical integration via the *mechanics of statistical matrices.*

It is obvious that here it is not necessary to use FDM techniques or any other classical numerical calculation method [11].

Single, double or triple finite statistical integration for 1D, 2D, 3D space is not complicated but a bit cautious.

The starting point is to discretize the space considered into n equi-distant free nodes then to calculate the B-transition matrix for diagonal input elements RO=0.

Then the next step is to calculate the transfer matrix Dnxn given by the above expressions 4,5,6.

For finite single integration formula

$I = \int Y\,dx$ we use the one-dimensional matrix B with RO=0.

Now the resulting finite integration statistical formula $I = \int_{x1}^{x7} y\,dx$ is the following numerical formula,

$$I = 6h/77\,(6.Y1 + 11.Y2 + 14.\,Y3 + 15.Y4 + 14.Y5 + 11.Y6 + 6.Y7) \ldots\ldots.(14)$$

For n = 7 nodes.

And likewise the statistical integration formula for 11 free nodes,

$I = \int_{x1}^{x11} y\,dx$

Gives:

$$I = 10\,h/\,145*[6.191Y1 + 10.715\,Y2 + 13.862\,Y3 + 15.921\,Y4\ 17.056\,Y5 + 17.4344025\,Y6 + \ldots + \ldots + 17.4344025\,Y11] \ldots(15)$$

For n = 11 nodes.

Equations 14,15 are the equivalence of the 1D Simpson's rule for 7 and 11 nodes respectively without the need for the statistical method of Lagrange multipliers or any other statistical assumptions.

Also note that equations 14 and 15 are valid for any function y=f(x) defined on x∈[interval x1 to xn] as shown in Fig.1.

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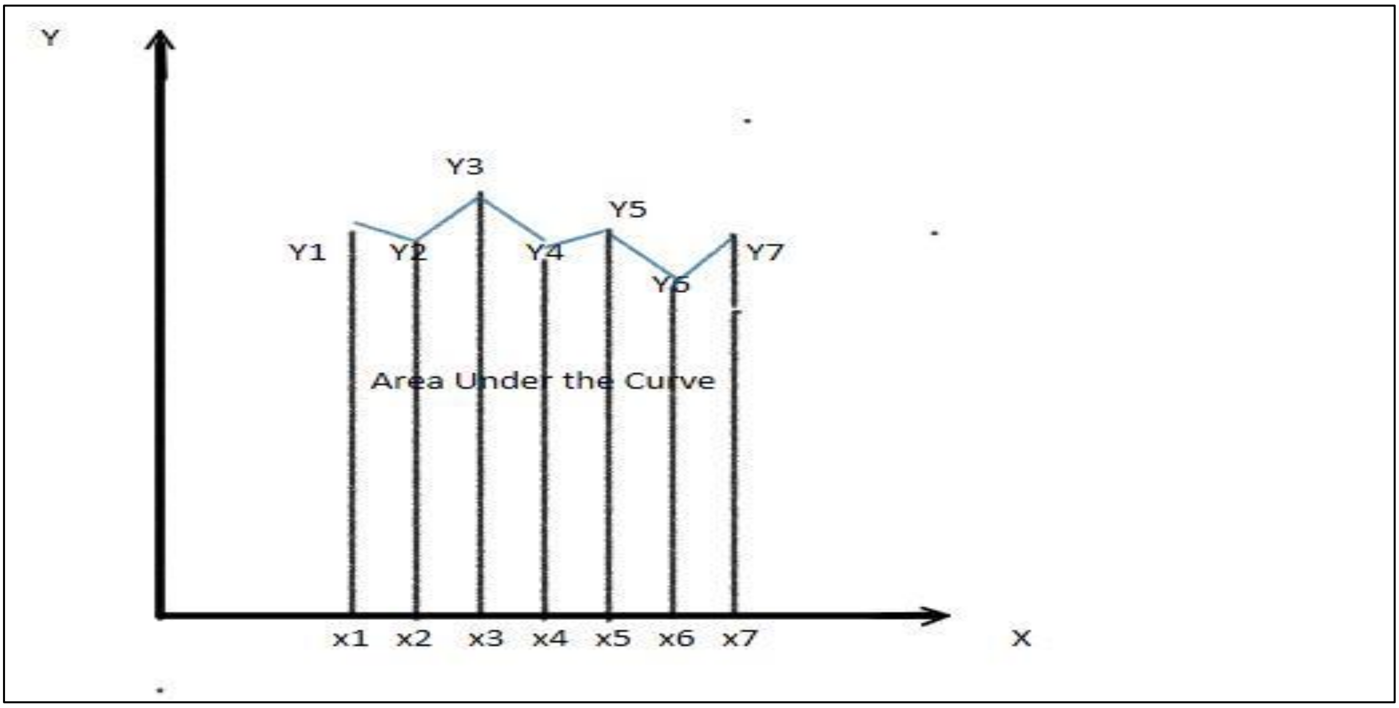


Fig 1 Finite 1D numerical integration equals the area under the curve.

It is worth mentioning that the numerical results of equations 14,15 are more accurate than those obtained from the trapezoidal rule and those obtained from Simpson's Rule [11].

**Also note that the artificial method of Lagrange multipliers or any other statistical assumptions are not required.**

This clearly shows that the numerical statistical method of matrix chains B in a 4D unit space is more complete than that of the classical D^4 manifold or 3D+external t method.

Classical mathematical numerical methods are today weak and tend to be useless in borderline cases.

Once again,

***The Laplacian theorem and B-matrix string techniques prove capable of creating excellent formulas forming new mathematics.***

*D. Q/A 4*

- *Can the Laplacian theorem and B-matrix chains be used in the derivation of statistical laws?*

Contributions of modern probability theory and statistics arising from transition probability in B-matrix strings have exceptional applications in theoretical mathematics, physics, and statistics.

The Gaussian distribution is a discrete or continuous probability distribution, sometimes called a normal distribution, and is widely used to model continuous/discrete random variables.

Additionally, the Gaussian distribution is the most important type of random variable, sometimes called the normal distribution f(x) of the random variable x, parameterized by a mean (μ) and variance (σ^2).

The Gaussian distribution is not easy to derive mathematically but it can be obtained in a simple way via B-matrix statistical techniques.

$f(x)dx = 1/ \sigma \sqrt{2}\, \pi \, \mathrm{Exp} -1/2( [x - \mu ]/ \sigma)2 \, . \, dx$……………..(16)

- *Under Normal Conventions.*

We expect the distribution of the energy density field resulting from the B-transition statistical matrix chains to be exactly the same as that of the Gaussian distribution Eq 16.

We also assume that it can simply be derived numerically using modern B-matrix statistical mechanics along the same route as statistical numerical integration (Q/A (3)).

It is worth mentioning that,

**The current definition of the Gaussian distribution is one of the most vague and misleading definitions in today's useless mathematics**:

"A discrete Gaussian distribution is a distribution over a fixed lattice where each point in the lattice is sampled with proportional probability to its probability mass according to the standard Gaussian distribution (in n dimensions)".

It is clear that the above definition is vague, misleading and should be replaced by [11,12]:

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**A discrete Gaussian distribution is a steady-state distribution for the temporal evolution of the interacting elements of any closed system, regardless of its initial conditions.**

The Gaussian distribution can be expressed as follows:

f(x) = C1. Exp (-x^2/σ^2)………………………………..(17)

In fact, the Gaussian or normal distribution (equation 17) is nothing other than the statistical weights given by equations 6,7 above.

We expect the distribution of the energy density field resulting from the B transition statistical matrix chains to be exactly the same as that of the Gaussian distribution Eq 16,17.

We also assume that it can simply be derived numerically using modern B-matrix statistical mechanics along the same route as statistical numerical integration (Q/A(3)). For example, in the 1D statistical integration formula: The statistical integration formula for 7 nodes is obtained from the formula [11,12],

I = 6h/77 (6.Y1 +11.Y2 + 14.Y3+15.Y4 +14.Y5 + 11.Y6 + 6.Y7)….(12)

And the statistical integration formula for 11 nodes gives:

I=10 h/ 145*[6.191+ 10.715 +13.862 +15.921 17.056+17.4344025 + . . +. . . and so on]. . (13)

By performing a numerical curve fit to the numerical values of the arguments or parameters of the dependent variable Y in Equations 11,12, you obtain values similar to those obtained from the Gaussian distribution of Equation 17 with C*1/ σ^2 = 0.07. and 0.047, respectively.

It is clear that the statistical equation 16 of the Maxwell-Boltzmann distribution is only the stationary state of the statistical integration formulas of the Cairo techniques, which leads to the so-called Gaussian distribution.

Needless to say,

**The Laplacian theorem and B-matrix string techniques prove capable of creating excellent statistical formulas, such as the Gaussian distribution, thus forming new mathematics never before known.**

*E. Q/A 5*

➢ *Can Laplacian's theorem and B-matrix strings be used to measure the speed of sound in audio rooms and the speed of light in a vacuum?*

- **A-Speed of Sound Waves in Air*

To our knowledge, there is no generally accepted PDE or rigorous theory regarding audio rooms.

In other words, there is no rigorous theory describing the spatio-temporal evolution of the sound energy density U Jm^-3 inside audio rooms.

The semi-imperial Sabine formula, sometimes called Sabine theory, proposed a century ago, remains the primary formula for calculating RT reverberation time in audio rooms, in addition to a rough estimate of sound volume in rooms audio.

We have proven that Sabine's formula for reverberation time TR is sufficiently accurate [14] but fails in calculating the non-uniform sound energy density field while the proposed Cairo techniques can do it with high accuracy and speed in a simple way.

Recently, few papers have appeared looking for theoretical evidence of reverberation time TR, but to no avail.

Chiara et al [15] carried out the calculation of the recerbation time TR in audio rooms but unfortunately without significant success. The failure of Chiara and other essays in New Research Papers in defining the diffusivity of sound in audio rooms and the failure in applying the diffusion PDE in audio rooms only because their calculations were based on the classic theory of 3D sound diffusion + external temporal control.

And yet, if the Laplacian PDE and Laplacian's theorem were successfully applied to audio room reverberations, it would be one of the best achievements ever seen before in sound theory.

The numerical statistical theory of Cairo techniques proposes the Laplacian PDE [13],

dU/dt)partial = α ∇^2 (U) + S

To apply for audio rooms as shown in Fig.2.

Where U(x,y,z,t) is the sound energy density J m^-3 and α m^2 sec^-1 is the diffusivity of the sound energy.

In analogy with the heat diffusion PDE.

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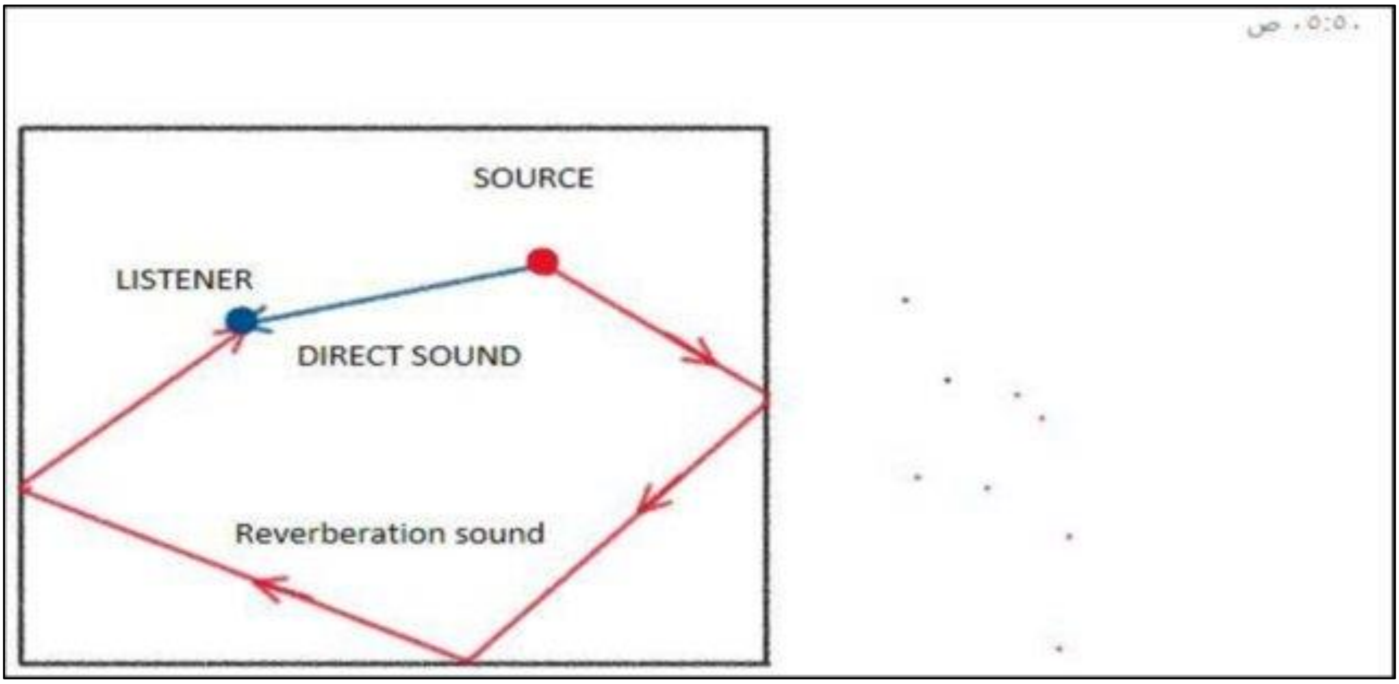

Fig 2 Diffusion of sound waves in audio rooms.

The diffusivity α of the sound energy density U(x,y,z,t) has never been correctly defined in audio rooms or elsewhere. The naive definition of thermal diffusivity as $\alpha = k/\rho$ s in normal conventions is almost useless.

The need for a common definition of diffusivity for all types of energy density is obvious.

We begin by explaining the conclusion of the so-called Laplacian theorem for a sound room of volume of sample space V surrounded by a closed surface A.

There are two types of diffusivity α [13,14]:

- Microscopic diffusivity with n free nodes inside V given by,

α = dU(x,y,z,t)/dt)partial/ U(x,y,z,t) . . . . . …………….(14)

And,

- Macroscopic diffusivity at the boundary surface surrounding V given by,

$\alpha$ = **C**. $U_{Limit}$ / $U_{nodes}$ ……………………………………(15)

**C** is the speed of the wave = 330 m/sec for sound and 3E8 for EMW.

Sabines semi-empirical formula for the reverberation time TR is expressed as,

TR = 53,46 V / $V_s$ A S,. . sec……………………………..(16)

Or,

Vs=Ls/ [4 V/L^2]

A striking fact is that the macroscopic diffusivity is exactly equal to the microscopic diffusivity.

The above fact belongs to energy conservation in a closed environment system. This format is a form of Laplacian's theorem or another equivalent formulation of Corollary 2 of Laplacian's theorem, equation 10.

It follows that the speed of sound $\mathbf{V_s}$ at NTP in audio rooms is given by:

$\mathbf{V_s}$=T1/2. Log 2 . L^2 / [4 V/A S]………………………..(16)

Knowing that 4V/AS equals the diffusivity of sound energy density in audio rooms α, then,

**Vs=T1/2. Log 2 . L^2 / [α] . . . (16*)**

Where,

**Vs** is the speed of sound.

V and A are the volume and internal area of the audio room, respectively.

S is the average sound energy absorptivity of interior walls.

If we compare equation 16 with the experimental formula of W. Sabine,

TR=53.13 V/AS Vs . . second

We get the speed of sound waves,

$V_s$ = 330 m s^-1

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- **B-Speed of EMW in vacuum*

Can the Laplacian theorem and B-matrix strings be used to measure the speed of light $\mathbf{C_{emw}}$?

The short answer is yes and $\mathbf{C_{emw}}$ follows exactly the same formula for sound speed C inside audio rooms.

The solution of the heat diffusion equation in 4D unit space via B-matrix string technique predicts that the signal speed which is the speed of light in vacuum $\mathbf{C_{emw}}$ as [22,23]

$\mathbf{C_{emw}}$=T1/2 .log 2 * L^2/ (thermal diffusivity α). . ……..(21)

The analogy between expressions 20 and 21 is shoking.

For the speed of light in equation 21 has the same expression as that for the speed of sound given by equation 20.

***The explanation is that the two waves respect the entanglement between the free node and the Dirichlet boundary conditions at the walls (equation 7).***

In the thermal tables we find [23],

α (Al) = 1.18 units E-5 MKS and α (Iron) = 2.5 units E-5 MKS.

In 2022, the author carried out thermal experiments on the cooling curves of metal cubes with a side of 10 cm and found the half-time cooling curve for Egyptian aluminum and Russian iron (low grade in carbon) as follows [22],

T1/2 for an aluminum cube with a side of 10 cm = 45 sec[14].

T1/2 for an iron cube of side 10 cm = 100 sec [14].

Substituting the above values for α and T1/2 into equation 21, we arrive at a value of Cemw close to ,

**$\mathbf{C_{emw}}$ = 2.9 E3 in both cases.**

Again, classical R^4 mathematics is useless for finding the value of energy diffusivity α in metals or for finding the correct relationship between α and $\mathbf{C_{emw}}$**.**

Again, it is not strange to find a relationship between the speed of light c and the thermal diffusivity of metals since the entanglement signal from free nodes to boundaries or walls and vice versa propagates at the speed of light **c**.

It is obvious that Laplacian theorem and numerical statistical theory of Cairo technique can measure the speed of sound in audio rooms and the speed of EMW in vacuum while classical R^4 mathematics is useless in this appearance.

*F. Q/A 6*

- *Can you explain the application of matrix chain B in solving 2D thermal conduction/diffusion PDE?*

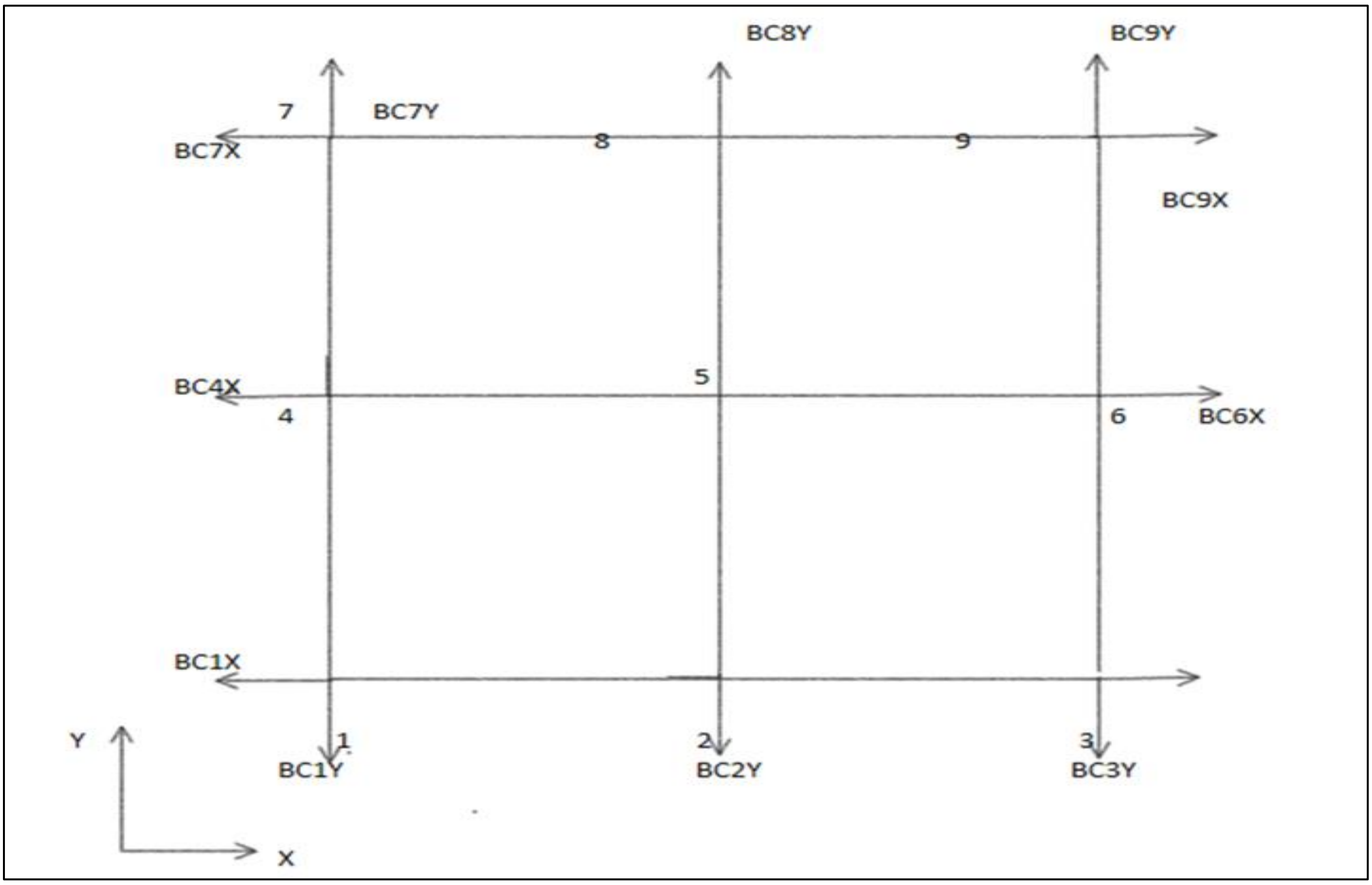


Fig 3 A 2D rectangular domain with 9 equidistant free nodes.

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Consider the simple case of a rectangular domain with 9 equidistantfree nodes, u1, u2, u3, ... u9 and 12 Dirichlet modified boundary conditions BC1 to BC12 reduced to 9 BC as illustrated in Figure3.

Mathews [4] classically solved the resulting thermal system in Figure 1 via 9 linear algebraic equations to find the steady-state temperature distribution using the Gaussian elimination method in a more efficient scheme by extending the tridiagonal algorithm to the The more sophisticated diagonal penta algorithm for its arbitrarily chosen vector of boundary conditions.,

b=[100,20,20,80,0,0,260,180,180] T................................(22)

And arrived at the solution vector:

U=[55,7143,43,2143,27,1429,79,6429,70,0000,45,3571,112,357,111,786,84,2857] T……………………………………….(23)

Now in the proposed method of Cairo techniques, the Dirichlet boundary conditions vector b corresponding to Fig 1 is simply written as ,

[100/4, 20/4, 20/4, 20/ 4, 80/4, 0. , 0.260/4, 180/4, 180/4] T……………………………………………………………………..(24)

The calculated transfer matrix D for RO=0 can be multiplied by vector (b) of formula 24 to obtain the numerical solution of the proposed Cairo technique, we obtain,

U=[55.7132187 43.2126846 27.1417885 79.6412506 69.997863845.3555412 112.856079 111.784111 84.2846451]T…………(25)

If we compare the statistical solution (25) proposed by the Cairo technique with that of Mathews (24), we see satanic precision.

The agreement between Mathews' results and the results from chain B of the matrix is striking.

**Even for the steady-state solution, the superiority of the Laplacian technique in creating new mathematics for the thermal PDE solution is evident.**

*G. Q/A 7*

- *How Cairo Techniques Numerical Statistical Theory solves the eigenvalue and eigenvector of a positive real square matrix?*

Consider the following arbitrarily chosen 4x4 square matrix A,

**A=**

| | | | |
|---|---|---|---|
| **1** | **2** | **3** | **4** |
| **5** | **6** | **7** | **8** |
| **9** | **10** | **11** | **12** |
| **13** | **14** | **15** | **16** |

The first step is to transform all rows (or columns) into statistical rows, i.e. the sum of their input elements = 1.

Note that the above statistical condition is the cornerstone of the transition matrix B and the stochastic Markov matrix.

We call the resulting matrix A*.

A*=1/10 2/10 3/10 4/10
5/26 6/26 7/26 8/26
9/42 10/42 11/4 12/42
13/58 14/58 15/58 16/58

The second step is to find A*^N for N sufficiently large, which implies that the entries of A*^N are all stabilized at certain values,

**A*$^{N}$ =**

| | | | |
|---|---|---|---|
| **0.1905** | **0.2302** | **0.26983** | **0.30950** |
| **0.1905** | **0.2302** | **0.26983** | **0.30950** |
| **0.1905** | **0.2302** | **0.26983** | **0.30950** |
| **0.1905** | **0.2302** | **0.26983** | **0.30950** |

A*N is the eigen matrix of A*which means,

A*N . A* = A*N

And,

A*N . A

| | | | |
|---|---|---|---|
| 779347/100000 | 17587/2000 | 979353/100000 | 269839/25000 |
| 779347/100000 | 17587/2000 | 979353/100000 | 269839/25000 |
| 779347/100000 | 17587/2000 | 979353/100000 | 269839/25000 |
| 779347/100000 | 17587/2000 | 979353/100000 | 269839/25000 |

The rest is obvious.

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*H. Q/A 8*

- *Can the statistical theory explain the formation and explosion of the Big Bang?*

The explosion of the Big Bang millions of years ago is a fact.

B-matrix statistical string theory can explain the formation and explosion of the Big Bang, as shown in Figures 4a, 4b [16].

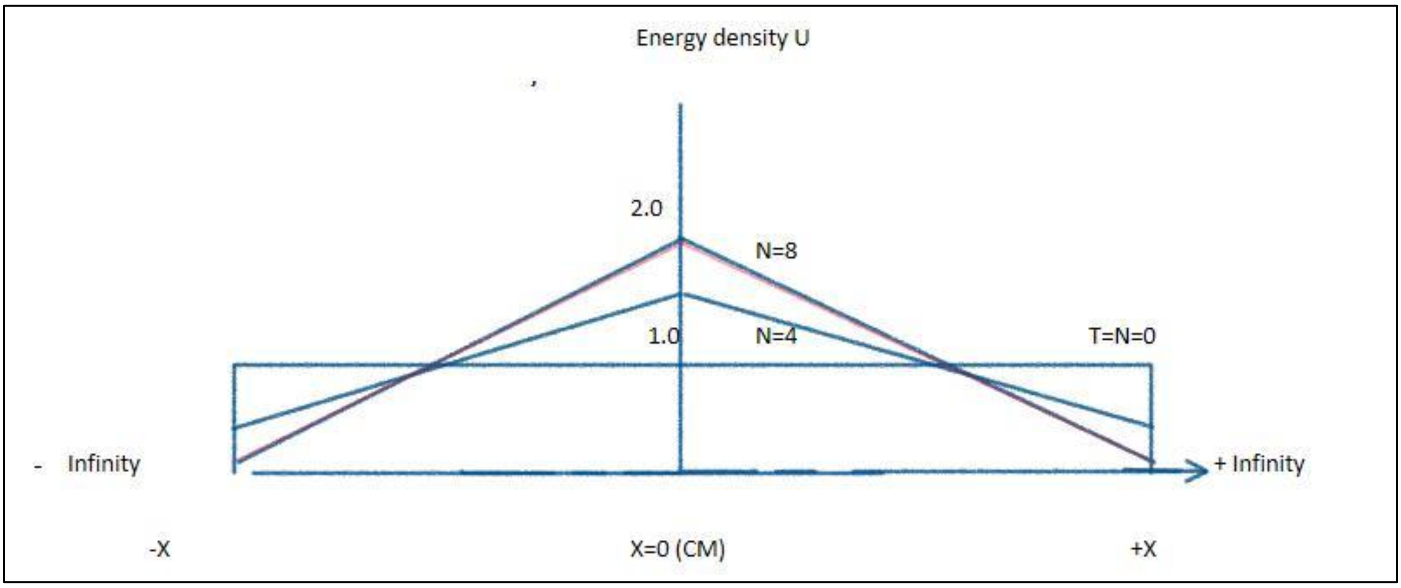


Fig 4a. Formation and explosion of the big bang at the center of mass point C.M.- Beginning of the first creation.

- *Energy density U(x,y,z,t) -infinity C.M x tends to +infinity*

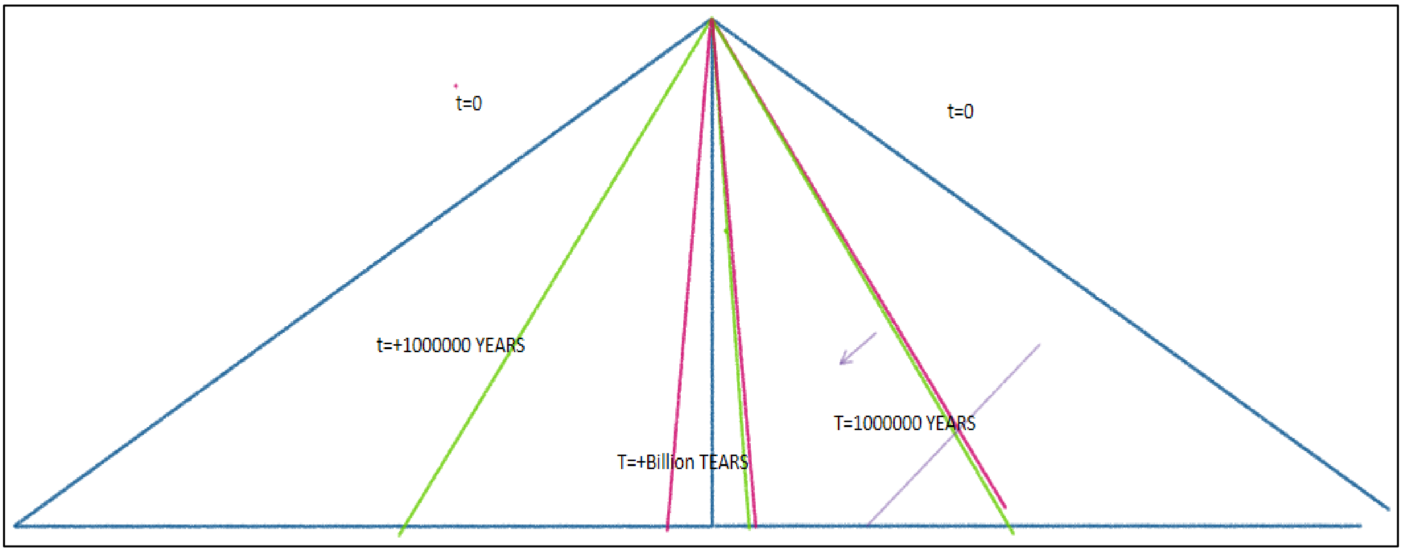


Fig 4b. Formation and explosion of the big bang at the center of mass point C.M. Creation developed.

The details of this topic are explained in detail in ref 16 and so there is no point in repeating it.

*I. Q/A 9*

- *Is unified field theory Schrödinger's wave equation or its square?*

The classic Schrödinger equation,

i h dΨ/dt)partial=-h2/2m . Nabla^2 Ψ+ V Ψ……………..(26)

OR,

H^Ψ = EΨ……………………………………………….(27)

Reduced form, must be conveniently replaced by its square Ψ^2 [17,18,19,20] to conform to the Laplacian PDE, and the Laplacian theorem which is logical and makes sense.

Note that the square of the Schrödinger wave equation is given by,

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ψ^2=ψψ*.

We therefore obtain,

dU/dt)partial=D.Nabla^2 U +S(x,y,z,t)………………….(28)

Where U=ψ^2=ψψ*.

It should be noted that the square of the classic Shrödinger PDE, which is equation 28, is not complete in itself and must be completed by the expression of the source term S via the rules of vacuum dynamics, namely:

S(x,y,z,t) =Constant * V(x,y,z,t)………………………...(29)

Then the solution of PDE 28 proceeds in a simple way, analogous to the Laplacian heat diffusion equation, to obtain ψ^2 and finally Ψ itself is found by calculating the square root of ψ^2[17,18,19,20].

This process is illustrated in Figure 5.

The Above numerical result are shown in figure 1,2 below

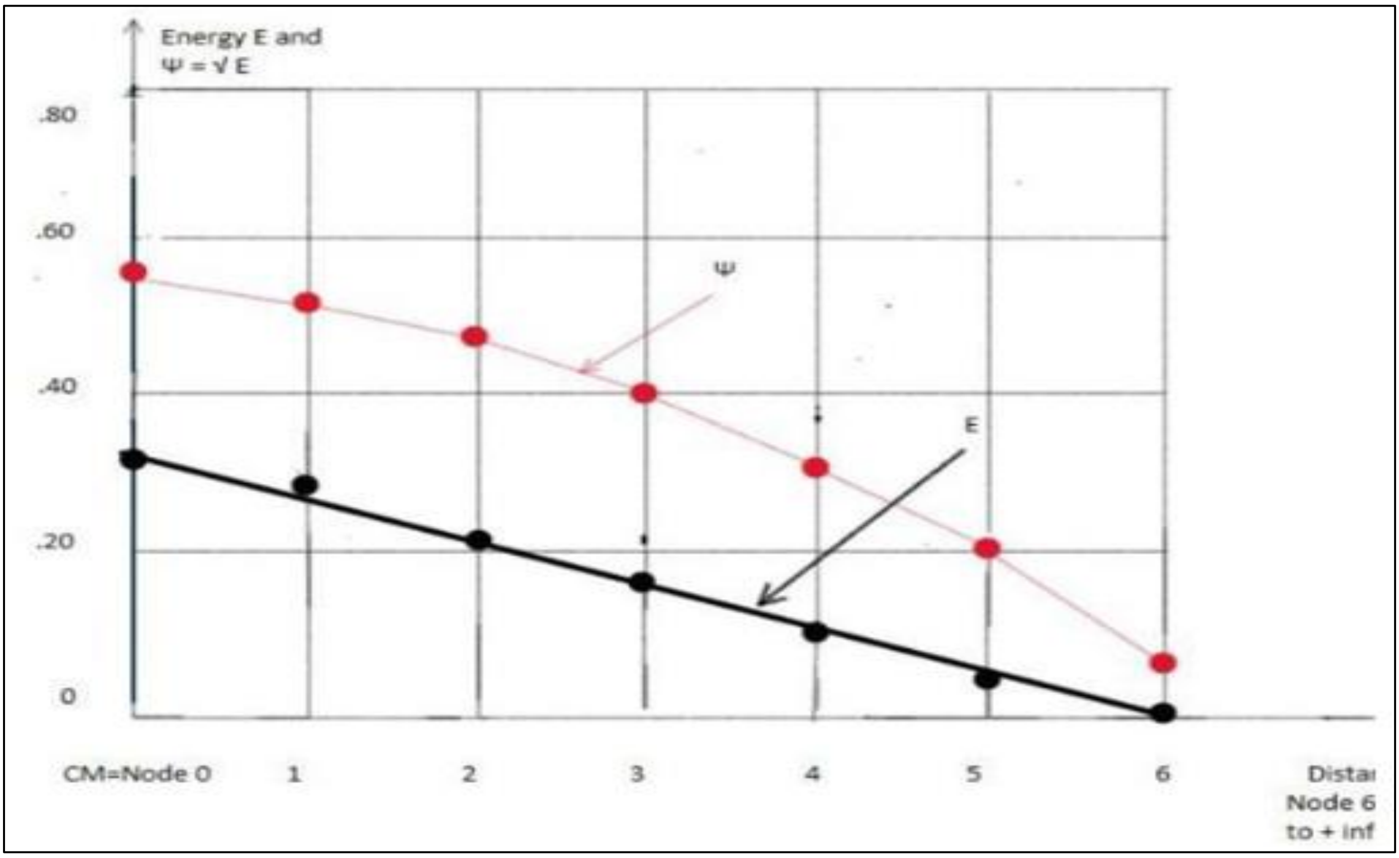


Fig 5 ψ^2(x) and its square root ψ(x) Fig.5.

*J. Q/A 10*

- *Can statistical theory explain and test the findings of Artificial intelligence AI?*

  The short answer is yes.

There is a solid ground for this brief response which is both the theory of Einstein's general relativity (theory of gravity) and the theory of Cairo techniques operate in the same 4D unitary space where time is woven or integrated in the 3D geometrical space.

The first common thread emerges from corollary 2, or equation 10, where the two theories (Einstein and Cairo techniques) explain the effect of energy density on the geometry of space and furthermore the two theories consider that the speed of light in a vacuum corresponds to the maximum speed of signal communication.

However, a rigorous treatment of this topic requires much more space than is currently available and will be better discussed in a later article.

*K. Q/A 11*

- *Using Laplacian matrix algebra, how to show that the infinite power series [(1+x)/2]^N is equal to (1+x)/(1-x), ∀x∈[0,1[ ?*

  We propose an axiom or a mathematical hypothesis:

[For a Laplacian power matrix A, A^2, A^3 etc., the sum of their igenic values is equal to the eigenvalue of their power series sum]

We call it Axiom 1.

To this end, we present the well-defined stochastic transition matrix B (which is replaced by A in the current analysis for convenience) previously explained in refs 1,2,3,6 and verify the above hypothesis.

Note that the matrix A and all its integer series are symmetric physical matrices and are not simply a set of numbers, because much information data is inherent in their structure and can be applied to many physical and mathematical situations.

For a simple cubic geometry, the square matrix A 8x8[21] is given by,

1-RO (1-RO) / 6 (1-RO) / 6 0.0 (1-RO) / 6 0.0 0.0 0.0
2-(1-RO) / 6 RO 0.0 (1-RO) / 6 0.0 (1-RO) / 6 0.0 0.0
3-(1-RO) / 6 0.0 RO (1-RO) / 6 0.0 0.0 (1-RO) / 6 0.0
4- 0.0 (1-RO) / 6 (1-RO) / 6 RO 0.0 0.0 0.0 (1-RO) / 6
5- (1-RO) / 6 0.0 0.0 0.0 RO (1-RO) / 6 (1-RO) / 6 0.0
6- 0.0 (1-RO) / 6 0.0 0.0 (1-RO) / 6 RO 0.0 (1-RO) / 6
7 - 0.0 0.0 (1-RO) / 6 0.0 (1-RO) / 6 0.0 RO (1-RO) / 6
8- 0.0 0.0 0.0 (1-RO) / 6 0.0 (1-RO) / 6 (1-RO) / 6 RO

- *Step 1*

Note that matrix A implies a specified RO.

For example, if RO is arbitrarily chosen equal to 0.2 then the numerical entries of the Laplacian matrix above A reduce to:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0.2 | 0.8/6 | 0 | 0.8/6 | 0.8/6 | 0 | 0 | 0 |
| 0.8/6 | 0.2 | 0.8/6 | 0 | 0 | 0.8/6 | 0 | 0 |
| 0 | 0.8/6 | 0.2 | 0.8/6 | 0 | 0 | 0.8/6 | 0 |
| 0.8/6 | 0 | 0.8/6 | 0.2 | 0 | 0 | 0 | 0.8/6 |
| 0.8/6 | 0 | 0 | 0 | 0.2 | 0.8/6 | 0 | 0.8/6 |
| 0 | 0.8/6 | 0 | 0 | 0.8/6 | 0.2 | 0.8/6 | 0 |
| 0 | 0 | 0.8/6 | 0 | 0 | 0.8/6 | 0.2 | 0.8/6 |
| 0 | 0 | 0 | 0.8/6 | 0.8/6 | 0 | 0.8/6 | 0.2 |

The eigenvalue of matrix A above is 0.6, which is equal to (1+RO)/2.

- *Step 2*

Continuing, the square of the Laplacian matrix A^2 is expressed as follows:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 7/75 | 4/75 | 8/225 | 4/75 | 4/75 | 8/225 | 0 | 8/225 |
| 4/75 | 7/75 | 4/75 | 8/225 | 8/225 | 4/75 | 8/225 | 0 |
| 8/225 | 4/75 | 7/75 | 4/75 | 0 | 8/225 | 4/75 | 8/225 |
| 4/75 | 8/225 | 4/75 | 7/75 | 8/225 | 0 | 8/225 | 4/75 |
| 4/75 | 8/225 | 0 | 8/225 | 7/75 | 4/75 | 8/225 | 4/75 |
| 8/225 | 4/75 | 8/225 | 0 | 4/75 | 7/75 | 4/75 | 8/225 |
| 0 | 8/225 | 4/75 | 8/225 | 8/225 | 4/75 | 7/75 | 4/75 |
| 8/225 | 0 | 8/225 | 4/75 | 4/75 | 8/225 | 4/75 | 7/75 |

**And its eigenvalue is equal to 0.36, or [(1+RO)/2]^2**.

***In general, the eigenvalue of the matrix A^N is equal to [(1+RO)/2]^N.***

Moreover,

Ev A^N=[(1+RO)/2]^N =ev1^N for all RO ∈[0,1[. . . .Rule 1

***The type of proof or validation for rule 1 is statistical proof never before known but well explained above in question/answer 2.***

Note that the Laplacian eigenvector is composed of the constant element vector, (k, k, ...., k), k different from zero, and its elementary eigenvalue ev1 is equal to (1 + RO) / 2 for all RO in the interval [0, 1].

For convenience, we denote the eigenvalues ev,s for A, A^2, A^3, ...., A^N by,

ev2 = evA^2=ev1^2, = [ (1 + RO) / 2] ^ 2

ev3 = evA^3= (ev1) ^ 3 = [(1 + RO) / 2] ^ 3, etc.

evN = evA^N= (ev1) ^ N=[(1 + RO) / 2] ^ N

We do not know how to perform the summation of infinite series [(1+x)/2]^N but we know how to perform the summation of infinite series of power matrix A^N given by,

E(N) = A^0 + A + A^2..... +A^N………………………...(31)

Where,

A^0 = I

Note that for N large enough, it is easy to find E by an algebraic mathematical series or by simple matrix inversion, that,

$E = [(I\text{-}A)]^{-1}$

And we define the transfer matrix D by equality,

D = E-I…………………………………………………(31)

- *Step 3*

Calculate the transfer matrices D and E.

For a large N and a arbitrary **R=0.2** as parameter,

The transfer matrix D is given by,

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 8/21 | 11/42 | 2/21 | 11/42 | 11/42 | 2/21 | 1/21 | 2/21 |
| 11/42 | 8/21 | 11/42 | 2/21 | 2/21 | 11/42 | 2/21 | 1/21 |
| 2/21 | 11/42 | 8/21 | 11/42 | 1/21 | 2/21 | 11/42 | 2/21 |
| 11/42 | 2/21 | 11/42 | 8/21 | 2/21 | 1/21 | 2/21 | 11/42 |
| 11/42 | 2/21 | 1/21 | 2/21 | 8/21 | 11/42 | 2/21 | 11/42 |
| 2/21 | 11/42 | 2/21 | 1/21 | 11/42 | 8/21 | 11/42 | 2/21 |
| 1/21 | 2/21 | 11/42 | 2/21 | 2/21 | 11/42 | 8/21 | 11/42 |
| 2/21 | 1/21 | 2/21 | 11/42 | 11/42 | 2/21 | 11/42 | 8/21 |

It is clear that the eigenvalue of the transfer matrix D above is equal to 1.2 which is exactly equal to [(1+RO)/(1-RO)]

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Needless to say the above result of ,

ev D=[(1+RO)/(1-RO)]………………………………….(32)

is valid for all values of RO ∈[0,1[.

- *Step 4*

Since the transfer matrix D is given by A +A^2 + A^3 . . +A^N for N tends to infinity.

Then applying rule 1 we get,

(1+RO)/2 +[(1+RO)/2] ^ 2 +[(1+RO)/2] ^ 3 +[(1+RO)/2^N =[(1+RO)/(1-RO)]….(33)

Therefore, for a large N,

If we replace RO with x in equation 33, we obtain the required proof.

It worth mention that here,

- ✓ The proof or validation of the above analysis, valid for all values of the main RO diagonal entries in the interval [0,1[, is just a statistic.
- ✓ The Laplacian theorem has generated important rule 1 never known before

***Once again the Laplacian theorem and the Cairo techniques can correct for many of the present idle math and can generates an infinite number of integer series formulas.***

*L. Q/A 12*

- *How to combine statistics from Cairo techniques with artificial intelligence (AI)?*

If we accept that Cairo's theory of techniques and Laplacian's theorem, equations 1,2,7 describe how nature works in a 4D unit space, then both reflect the intelligence of nature (NI).

Albert Einstein once said that nature has its own intelligence (NI) which is superior to human intelligence and humans can observe it.

We propose that the simulation of nature's intelligence is none other than the Cairo theory and Laplacian techniques, etc.

Therefore, we suggest that artificial intelligence (AI), which is a simulation of human intelligence, and (NI), which is a kind of simulation of nature intelligence, can be combined.

Markov's rooms contain a large number of uses in the IA generation.

It also serves as a base for generating sequences of basic donation points on the transition capabilities into the settings.

Concerning the idea of completing the IA by natural intelligence (NI), our proposals for the application will be included in 3 steps of consecutives:

- Trouble the solution for the highest efficiency in a social problem without using an effective algorithm.
- This solution has been developed and tested by NI nature intelligence to achieve one of its development ideas at the same time.

In these terms, there is stability and convergence of the solution as long as it is possible to continue in the future at low temperatures.

This will be directed via statistical techniques and matrix designs B.

- Depending on the tape result 2, whether positive or negative, the solution proposed by AI can be accepted, refused or postponed.

Improving artificial intelligence (AI) involves several strategies and techniques. Here are some key methods:

- Data quality and quantity
- Model Algorithm Improvements
- Human-AI collaboration
- Explainability and transparency

Regarding the idea of complementing AI with Nature Intelligence (NI), it is an intriguing concept. Natural intelligence refers to the intelligence observed in natural systems, such as the behavior of animals, plants, and ecosystems. Here's how AI and NI can complement each other:

Note: Natural systems are often very resilient to change and disruption. AI can benefit from these principles to create more robust and adaptable models.

## III. CONCLUSION

The numerical theory of Cairo techniques and the Laplacian theorem constitute an advanced and exhaustive form of the energy continuity equation in 4D unit space and thus can create new mathematics.

This is also the case of the famous Schrödinger time-dependent PDE.

The Laplacian partial differential equation applied to an isolated sample spatial volume surrounded by a closed surface A has the typical form of:

dU/dt)partial = α Nabla^2 U+ S

Subject to Dirichlet boundary conditions.

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The Laplacian PDE itself is always processed mathematically through an external 3D+ temporal mathematical space which is lazy and misleading.

The correct treatment of Laplacian PDE must be physical using its natural physical properties described by the Laplacian theorem.

We present the top 10 useless or misleading mathematical and physical situations in different areas of classical and quantum physics where Laplacian's theorem and B-matrix strings can create a superior replacement.

What is quite respectable is that the LPDE and Laplace's theorem, which are sort of universal rules, can generate universal rules and hypotheses as well as numerical solutions for time-dependent PDEs with more precision than those currently available.

*The author uses his own double precision algorithm [24,25,26].*

*Python or MATLAB library is not required.*

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