New Physics: Theory and Practice

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Abstract

Mathematics entered physics as a tool, but gradually transformed itself to become the master.

In the sense that most people believe that mathematics can generate new physics when the opposite is true.

In short, scalar and/or vector forms are not adequate for defining and/or describing physical quantities and, therefore, we must resort to a matrix/tensor description of physical quantities, sometimes called statistical chains of transition matrix chains B or Q for classical and quantum systems respectively.

In this article, The author the author defines and applies the quantum statistical chains Q and the classical statistical chains B to present a new reformulation for quantum physics and **classical physics, as well as pure mathematics, probability and statistics in .**

We believe that this new physical reformulation is far better than the classical one for understanding and describing the nature of our universe, which exists and operates in a unified four-dimensional space x-t, where the positive time axis t

intersects and is perpendicular to the three perpendicular geometric axes x, y and z.

The foundation of the theory presented in this article rests on the following revolutionary equation:

Stress tensor × Strain or curvature tensor = I... (1)

For all free nodes located within the defined control volume of the physical problem under study.

i-Furthermore, we believe that equation 1 allows us to solve all problems in classical and quantum physics, as well as in pure mathematics and statistics.

ii-The physical significance of equation 1 is that each case, in both physics and mathematics, possesses its own energy density and its own spacetime curvature.

iii-The miracle of Equation 1 lies in its generality, that is, its application to all types of energy density U(x,y,z,t) in the most general case (electromagnetic energy density, quantum energy density, gravitational energy density, etc.), thus unifying all theories of energy density, such as quantum mechanics and general relativity, into a single theory.

Another physical significance of equation 1 is that spacetime xyzt is Lorentzian, in that it conserves its volume under the effect of motion, which is also a necessary condition for physical entropy, according to the second law of thermodynamics.

At the extreme, one could say that equation 1 is the only acceptable law in both mathematics and physics. In this

sense, any mathematical or physical law or rule compatible with equation 1 must be accepted; any other would be refuted.

This is the subject of the present article.

In the present paper we introduce and answer the 4 important and urgent questions:

1. What is the problem with the Schrödinger partial differential equation?

2. How do the B and Q matrix chains represent new physics in quantum and classical mechanics?

3. Can it be shown that the Schrödinger equation and Einstein's theories of general and special relativity belong to the same theory?

4. What is the Planck distribution in quantum mechanics, and how can it be derived from the statistical quantum transition matrix Q?

Surprisingly, the fascinating challenge of combining Schrödinger's partial differential equations with Einstein's theory of special and general relativity, and solving time-dependent partial differential equations, becomes as simple as a school exercise when applied to the scientific principles of the new statistical theory of Cairo Techniques.

A perfect example of this is the replacement of the classical Schrödinger equation of 1927 with its quadratic form to align with modern physics (equation 1):

When the classical Schrödinger equation in 1927 is transformed into its square,

i-The squared equation is transformed to conform to Einstein's theories of special and general relativity.

ii-The squared Schrödinger equation is transformed into a relatively invariant partial differential equation in the appropriate spacetime, as it should be!

It is also worth noting that these modern scientific techniques do not use differential calculus or finite difference methods, but rather rely on the statistical perspective of the B and Q transition matrices.

Finally, it should be clarified that this article is not intended to minimize the major contributions of great physicists and mathematicians such as Einstein, Schrödinger, Heisenberg, Minkowski, Hilbert, and Riemann, among others, but rather to address the main slips and limitations of their theories, where applicable.

Note: If you are not familiar with the universal laws of physics, please stop reading.

This article is not intended for you

I.Comprehensive introduction containing theory and numerical results

Mathematics entered physics as a tool, but gradually transformed itself to become the master.

In the sense that most people believe that mathematics can generate new physics when the opposite is true.

The fundamental concept of the revolutionary reforms of the new physics rests on the idea that the nature of our universe resides in a truly unified four-dimensional space x-t, where time t is considered a fourth axis intrinsically linked to the three geometric axes x, y, and z, unlike the classical three-dimensional geometric space xyz where time t acts as a separate external controller [2-7].

This latter erroneous space, which we consider the source of all evil, has been the norm throughout the last century.

Therefore, we assume that the transformation of any physical or mathematical problem into this revolutionary new space will admit a natural and accurate statistical solution, operating in a suitable four-dimensional spacetime, x-t, bounded by a closed control volume. This control volume (sometimes called the Abbas control volume for distinction) forms one of the foundations of the Cairo Techniques theory [2-7].

Note that the statistical chains of the B transition matrix are not entirely new, as they have worked efficiently to solve almost all types of classical and quantum physics, as well as pure mathematics and statistics, since their discovery by the author in 2020[2,3,4,5,6,7,8].

The transition matrix B = (Bi,j) is well-defined by four statistical assumptions i-iv [13,14,17,21].

i-For a 2D Cartesian coordinate system, the elements Bi,j satisfy the following conditions:

i - Bi,j = 1/4 for i adjacent to j, and B i,j = 0 otherwise.

ii - Bi,j = RO, meaning that the main diagonal is composed of constant entries RO.

For the heat diffusion equation, RO can take any value in the closed interval [0,1], while for the Laplace and Poisson PDEs, RO = 0. In other words, B is a zero main diagonal matrix.

This corresponds to the assumption of a zero residual after each time step for all free nodes.

iii – Bi,j = Bj,i for all i, j. Matrix B is double symmetric, in accordance with the physical principle of detailed balance.

iv - The sum of Bi,j = 1 for all rows far from the edges and the sum of Bi,j < 1 for all rows adjacent to the edges, which means that the probability of the entire space is equal to 1.

Clearly, the statistical matrix B is very different from the classical mathematical Laplacian mathematical matrix A and the Markovian transition matrix M.

The physical nature of the B matrix is clear and briefly explained above by conditions i to iv, which confirm hypothesis 3.

However, the accuracy and precision of the numerical results obtained by B-matrix chain techniques for all theories of quantum mechanics, general relativity and emw theory and periodic PDEs show, in references 13, 14 and 15, that these three theories all belong to B-matrix chains in the same way.

They belong to one and the same theory, that of equation 1[7-14].

Introducing new physics

The starting point is the Cauchy Rieman stress strain tensor in 3D geometric space xyz

Fxx Fxy Fxz

Fyx Fyy Fyz

Fzx Fzy Fzz

We call it matrix/tensor M1

X

1/strain tensor (We call it matrix/tensor M2)

=modulus of elasticity

The first fantastic breakthrough here consists of transforming the Cauchy-Rieman stress tensor into an energy density tensor U(x,y,z,t) Jm-3 sec in the form of a Laplacian stress matrix and similarly transforming the 3D Cauchy-Rieman strain tensor into a 4D unitary spatiotemporal curvature, namely:

energy density tensor for U(x,y,z,t)=

∇^2xx ∇^2xy ∇^2xz ∇^2xt]U(x,y,z,t)

∇^2yx ∇^2yy ∇^2yz ∇^2yt]U(x,y,z,t)

∇^2zx ∇^2zy ∇^2zz ∇^2zt]U(x,y,z,t)

∇^2tx ∇^2ty ∇^2tz ∇^2tt]U(x,y,z,t)

We call it matrix stress tensor M3

Where, ∇^2xx = d/d^2 (partial) and ∇^2xy = d/d^2 (partial) x y and

And the second fantastic advance consists, in the same way, of transforming or generalizing the 3D Cauhy geometric deformation tensor into a 4D xyzt unit spacetime curvature, namely:

∇^2xx ∇^2xy ∇^2xz ∇^2xt

∇^2yx ∇^2yy ∇^2yz ∇^2yt

∇^2zx ∇^2zy ∇^2zz ∇^2zt

∇^2tx ∇^2ty ∇^2tz ∇^2tt

We call it the M3 matrix spacetime tensor.

The third and greatest fantastic and consistent advance is to reasonably assume that [2-7]:

Stress tensor × Spacetime tensor = I …(1*)

Or,

M□ × M□ = I the identity matrix . . . . (1*)

Equation 1* is the only valid one in statistical matrix mechanics because it is Pythagorean, preserves the continuity of total energy and the direction of time (the effect precedes the cause, and not the other way around), among other things.

The statistical matrix mechanics is our choice.

Equation 1* has another clear physical meaning:

We live in a conductive world based on one single statistical theory.

The space-time tensor of our universe has been Lorentzian since the Big Bang [15,16,17], millions of years ago, and even after, which means that it retains its volume despite movement.

It is worth noting that Albert Einstein made two errors in his 1915 theory of general relativity:

1- He wrote equation 1* in reverse order.
2- 2- He claimed that equation 1* applied only and explicitly to the gravitational field of large masses, whereas in reality, it applies to all types of energy density, such as electromagnetic energy density, quantum energy density,

An important property of the energy density field is that any kinetic energy density field induces a curvature of spacetime [2-7,12,19,21], similar to that which the theory of general relativity explains by gravitational energy, stress, and strain. sound wave energy density [24,25], etc.

Q1.

What is the problem with the Schrödinger partial differential equation?

A1.

We assume that Schrödinger's partial differential equation is fundamentally incomplete because it is not entirely Pythagorean.

Furthermore, we all know that the classical Schrödinger equation of 1927 is not invariant under relativistic transformations.

The question then arises:

Does reformulating the Schrödinger equation in the proposed new squared form, with the physical transition matrices B and Q, make it compatible with equation 1 and therefore invariant under relativistic transformations?

To our great surprise, the answer is yes!

Neither Einstein nor Schrödinger correctly interpreted the generalized Pythagorean theorem as a conservation of unitary four-dimensional spacetime (x, y, z, t) [12,15,19.20].

In other words, the space x, y, z can be converted into time t and vice versa [1,2,3,4,5,6].

Negative scattering shown in Fig 2 , which is indispensable in quantum mechanics, means that the force of the system is directed towards the center of mass (CM), which is at the

origin of the Big Bang that occurred millions of years ago and continues to this day.

The chains of statistical transition matrices B and Q show that the negative diffusion transition matrix Q exists and is equal to the square root of B as shown in Figs 1,2

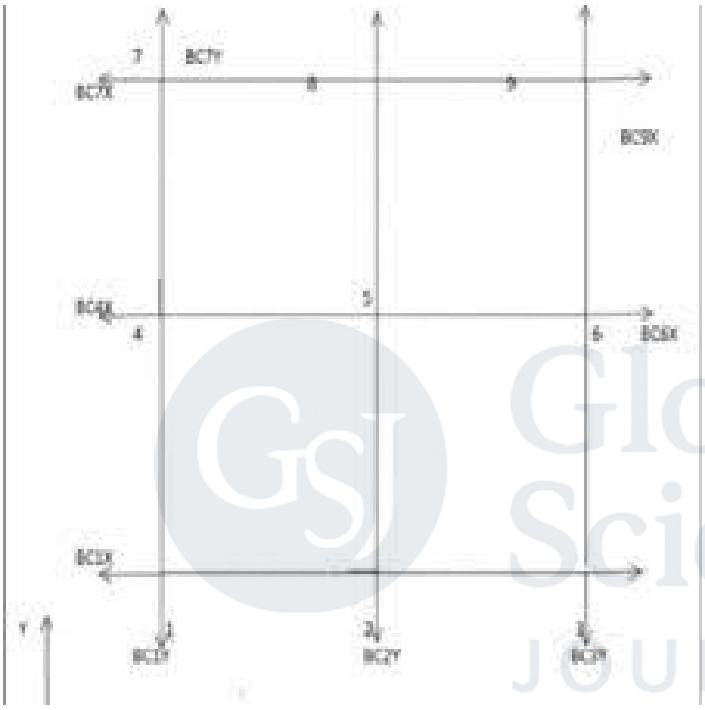

Fig. 1.A 2D rectangular square discretized into 9 equidistant free nodes with 9 Dirichlet boundary conditions To fit the matrix chains B.

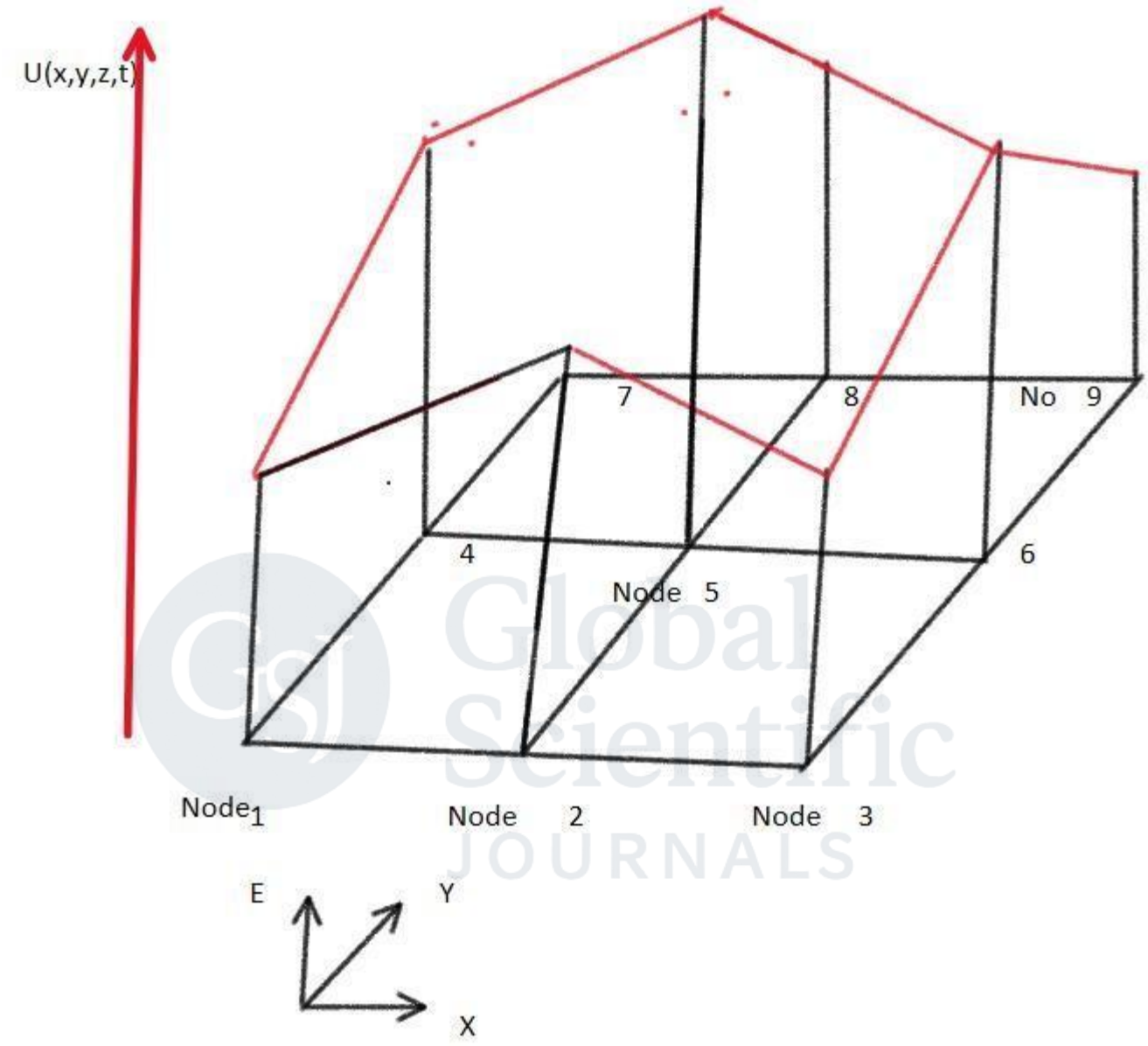

Figure 2. A 2D rectangular square discretized into 9 equidistant free nodes with 9 Dirichlet boundary conditions. To fit the Q matrix chains. Note that triangularizng the Dirichlet boundary conditions is essential.

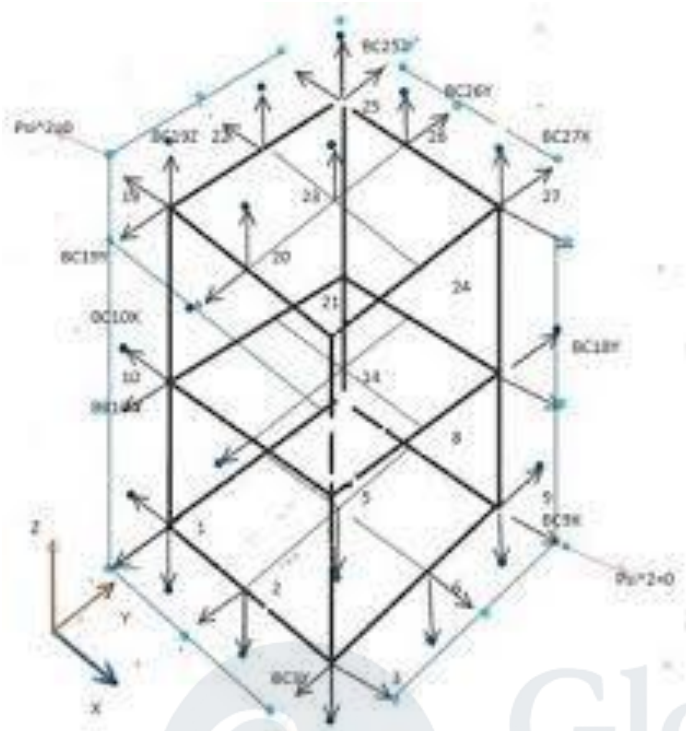

Figure 3. A three-dimensional cube with side length L divided into 27 equally sized free nodes with 27 Dirichlet boundary conditions. For the construction of matrix B strings

Furthermore, the quantum transfer matrix D(Q) exists and is equal to 1/[(I-Q)-I] for sufficiently large N.

It should be noted that to date, we know of only two types of transition matrices:

The statistical Markov transition matrix [18] and the chains of transition matrices B, which are much more efficient.

It should also be noted that the Heisenberg quantum transfer matrix is neither a transition matrix nor a statistical matrix.

Moreover, replacing the classical Schrödinger equation of 1927 with its square transforms it into a relativistic PDE invariant in proper spacetime, as it should be![19]

Consider the case of Fig.2 where we are going to find the quantum transition matrix Q and the quantum transfer matrix D(D) in addition to several rules and theorem's in quantum mechanics.

We believe that the subject of quantum mechanics has not yet been fully studied, and that there are many new rules and theories of physics waiting to be revealed.

Step 1

The B transition matrix 9x9 for figure 2 is expressed as:

B=

0	1/4	0	1/4	0	0	0	0	0
1/4	0	1/4	0	1/4	0	0	0	0
0	1/4	0	0	0	1/4	0	0	0
1/4	0	0	0	1/4	0	1/4	0	0
0	1/4	0	1/4	0	1/4	0	1/4	0
0	0	1/4	0	1/4	0	1/4	0	1/4
0	0	0	1/4	0	0	0	1/4	0
0	0	0	0	1/4	0	1/4	0	1/4

0 0 0 0 0 1/4 0 1/4 0

Step 2

The 9x9 quantum transition matrix Q in Figure 2 is expressed as follows:

Q = √B

This is a blocked and impossible root since the matrix B is singular, meaning its determinant = 0.

Step 3

We take another route.

The steady-state transport or transfer matrix D(N) for sufficiently large values of N is given by the following relation:

D(N) = (1/(I-B)-I)

for sufficiently large values of N.

The results of the numerical calculations give the transport matrix D(N) 9x9 as follows,

D(N)=

305/1526 302/763 193/1526 44/109 28/109 12/109 241/1526 90/763 87/1526

2447/6104 501/1526 2419/6104 30/109 225/436 28/109 1123/6104 311/1526 703/6104

15/109 44/109 22/109 16/109 30/109 44/109 19/109 16/109 15/109

2433/6104 389/1526 669/6104 37/109 223/436 20/109 2733/6104 409/1526 689/6104

29/109 56/109 28/109 60/109 58/109 56/109 44/109 60/109 29/109

913/6104437/1526 2509/6104 34/109 255/436 39/109 3133/6104 585/1526 2657/6104

14/109 12/109 6/109 44/10 28/109 12/109 25/109 44/109 14/109

703/6104 283/1526 675/61030/109 225/436 28/10 2867/6104 529/1526 2447/6104

101/1526 90/763 199/15216/109 30/109 44/109 375/1526 330/763 319/1526

Step 4

It is predicted that the quantum transfer matrix D(Q)=SQRT D(B) but again This is a blocked and impossible root since the matrix D(N) is singular, meaning its determinant = 0.

Therefore we find the solution of the heat diffusion equation corresponding exactly to the corresponding operating medium normally vacuum, geometrical shape and boundary conditions say F(x,y,z).

Step 5

The solution to the quantum problem f(x,y,z) will be the square root of the heat diffusion equation, i.e.:

$f(x,y,z) = \sqrt{(F[x,y,z])}$

Note that f(x,y,z) is complex valued function.

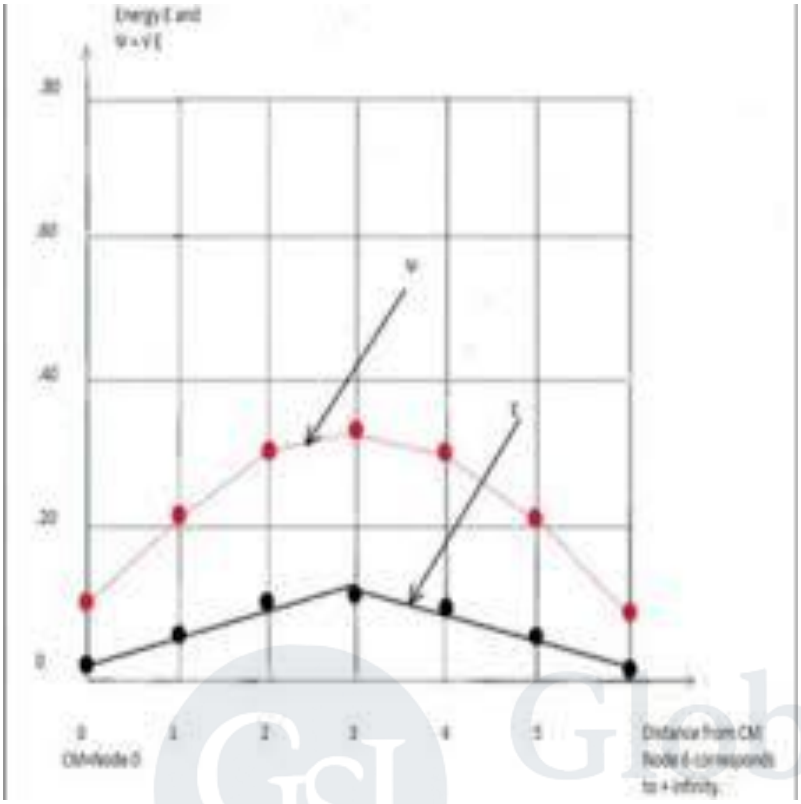

Fig. 4 Precise 1D correspondence between the quantum mechanics solution and the square root of the corresponding heat diffusion.

Note that figure 4 is the correct answer to question 2.

MAIN CONCLUSIONS

1-The solution to the quantum energy density equation is real, while the quantum energy density matrix is complex.

2- The triangular shape of the boundary conditions is essential for the existence of a quantum energy density solution in 1D, 2D, and 3D.

3-The negative scattering of the quantum energy density, linked to the triangular boundary conditions of the quantum system, is intrinsic.

Regarding questions 3 and 4, we believe that they have been adequately addressed in the full introduction and numerical results and that it is not necessary to repeat them in order to avoid excessively lengthening the article.

II. NOTE ON THEORY and NUMERICAL RESULTS

Nature is statistically symmetric and bounded [1]Nature's creatures exhibit a wide range of symmetry, from the intricate patterns of snowflakes to the streamlined bodies of sharks.

What you need to master operation of B-matrix chains or any other statistical theory is:1-Perfect knowledge of universal laws of physics theory and practice from distinguished text books [22,23] .2-Mangement of programming language and their corresponding best algorithms [26,27,28].3-Personally we recommend programming language as Fortran or C++.Every physical or mathematical problem has a natural statistical solution that works in appropriate bounded control volume which is in itself the theory of Cairo techniques. The above fact was the core of generating previous published articles entitled How to generate new mathematics parts 1,2,3,4,5,6 as well as New physics and quantum mechanics which is the present one is A 2D the closed control volume shown in Fig.1,2.

III.CONCLUSION

Nature is statistically symmetric and bounded [1]

Nature's creatures exhibit a wide range of symmetry, from theintricate patterns of snowflakes to the streamlined bodies of sharks[1,4,5]. Every physical or mathematical problem has a

natural statistical solution that works within an appropriate specifiedcontrol volume, which in itself is the theory of Cairo techniques in statistical mechanics.

We reiterate that Abbas's statistical mechanics based on the statistical transition matrix B is entirely new physics, different from Heisenberg's transition matrix, which is neither statistical nor a transition matrix.

The above fact was the core of relieving previous articles entitled How to generate new entitled How to Generate New Mathematics-Parts I, II , III, IV,V and VI in addition to Can we think outside thebox and How to Merge Quantum mechanics in General Relativity in addition to New Physics and Quantum Mechanics.

In this article we introduced and analysed 2 important and urgent questions:

1-What is the grave mistake in Schrödinger's partial differential equation in 1927?

2-Is it true that Schrödinger's partial differential equation in 1927 is nothing but the square-root of heat diffusion PDE?

Thanks to the statistical theory of B-matrix chains a product of Cairo techniques, the answer to all the above questions is generated

as yes and further more new rules and theorems have been generated. Note that in this article we completely ignore Schrödinger’s theory of QM and Einstein theory of gravity or GR as if they never existed.

The Matrix mechanics of Cairo techniques is our new statistical mechanics choice.

We assume that the statistical transition B-matrix chains which combines the universal laws of continuity of total energy, Pythagoras, and Einstein curvature among others is the only valid statistical mechanics and that any trial to generate equivalent one is doomed to fail.

NB. The author uses his own double precision algorithm, such as that of references 28,29,30,31.

No FDM techniques, no ready-to-use Python or MATLAB algorithms are needed.

Aknowledgement

The author expresses his gratitude to the Military Technical College, a distinguished part of Cairo University where he began his work at the college as a lecturer assistant in physics and mathematics, in collaboration with an extremely distinguished group of Czechoslovak and Russian experts. An experience that was both enjoyable and rewarding until he later became a professor and head of the Department of Basic Sciences, which comprises experimental and theoretical physics as well as pure mathematics.

During this long experience. He went to the Atomic and Nuclear Physics Center in Toulouse, France, where he earned his doctorate and worked as a professor at ULP and

UPS Universitas, as well as a research director at CNRS in France.

The last experience, as with the first, was an opportunity to collaborate with the best leaders and the latest scientific knowledge.

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