Is it time to unify physics and mathematics? - PART III?

Ismail Abbas, Sherif Ismail, Nora Abbas

Abstract

If you do not understand classical and quantum physics—or mathematics—ask yourself: "Am I the only one?" After all, others do not understand them either.

Mathematics entered physics as a tool, but gradually, it evolved to become the master.

Physics and mathematics may appear to be separate fields, but a deeper look reveals that they are, in fact, a single, inseparable discipline.

In two previous articles titled "Is It Time to Unify Physics and Mathematics? (Part I and Part II)," we posed and discussed a series of significant and pressing questions—along with their answers—that demonstrate how physics and applied mathematics are, at their core, two sides of the same coin: nature.

In fact, classical physics, quantum physics, and applied mathematics all fall under a single universal law of physics, expressed by Equation 1* [2-9]:

Curvature of energy density U (x,y,z,t) × Curvature of spacetime C (x,y,z,t) = I n,n . . .. . (1*)

Here, n represents the number of free nodes distributed at equal intervals within the given configuration (whether one-dimensional, two-dimensional, or three-dimensional); this

should not be confused with N, which represents the number of iteration jumps.

In this article, we extend the scope of applications for the same traditional approach by using Equation 1*, which has proven successful in bridging physics and mathematics.

It is worth noting that Equation 1* stands as one of the most well-established and reliable equations in the fields of physics and applied mathematics; any rule or theory that fails to align with it is, by definition, incomplete—or even incorrect—and must therefore be refuted.

At the limit we would say that equation 1* is the only equation describing nature.

In fact, Equation 1* was proposed and applied in an innovative manner by the author during the years 2020, 2025, and 2026 [2–13] to describe new physics and new mathematics within a closed control volume bounded by a closed surface, subject to Dirichlet boundary conditions.

The authors describe Equation 1* as the "golden equation," because it resolves all physical and mathematical problems—regardless of their origin—by treating them as special cases of itself. This article examines the aforementioned expression, focusing on new concepts—such as the modern "Cairo transform" (as opposed to the classical "Fourier transform") and "Cairo paradoxes"—leading to the conclusion that equation (1*) warrants this designation.

In the subsequent sections of this article, we adopt a clear approach—akin to that employed in references [2–9]—in which we utilize Equation (1*) to derive new laws and theorems across the fields of mathematics, classical physics, quantum mechanics, and electromagnetic theory. Furthermore, we define and introduce a new transformation, which we term the "Cairo transform," and present a set of original paradoxes that we call the "Cairo paradoxes."

So, we agree that this is an accurate answer to the question posed in the title of this article:

Yes, the time has come to unify physics and mathematics.

Finally, it should be noted that this article does not aim to diminish the significant contributions of great physicists and mathematicians—such as Albert Einstein, James Clerk Maxwell, Erwin Schrödinger, Niels Bohr, Werner Heisenberg, Hermann Minkowski, David Hilbert, Bernhard Riemann, and others—but rather seeks to highlight key gaps and shortcomings in their theories, wherever they may exist.

Note: If you are not familiar with the universal laws of physics, please stop reading, this article is not intended for you.

A comprehensive introduction covering both theory and numerical results.

Physics and mathematics are two sides of the same coin (Nature) and should be unified within a single, four-dimensional (4D) spacetime. The Lorentz transformation demonstrates that the invariance of the speed of light, C=3E8, necessitates that space and time be inseparable within a curved spacetime. This insight led the authors to introduce a "fundamental equation" (denoted as 1*) within a new, unified 4D spacetime. They argue that physics and mathematics can be unified—through the geometry of this spacetime—into a single theory, or more precisely, into one rigorously defined equation: $U(x, y, z, t) \cdot C(x, y, z, t) = I_{n,n}$ (1*), where $I_{n,n}$ denotes the $n \times n$ identity matrix, and n represents the number of equidistant free nodes within a given closed control volume, bounded by a closed surface subject to Dirichlet boundary conditions. Equation 1* is entirely novel—never before proposed—and was first introduced by the authors in their work starting in 2020 [2-13].

Reference 1 offers an elegant and in-depth description of this new techniqes—along with its associated theorem—which the author refers to as the "Cairo techniques."

Zenodo-ismail abbas innovations and paradox" refers to a collection of research papers and records deposited on the Zenodo platform by Dr. Ismail Abbas M. Abbas, a PhD lecturer at Cairo University. His work centers on a conceptual framework termed "Abbas New Physics," which seeks to

resolve foundational paradoxes in quantum and classical mechanics by replacing purely abstract mathematics with 4D statistical numerical frameworks.

Core Innovations & Key Concepts

- The "Cairo Techniques": This is a 4D unitary numerical statistical method developed by Abbas. It utilizes transition chains and B-Transition Matrices to numerically calculate energy and quantum probability distributions.
- Bounded Statistical Systems: Abbas models both classical and quantum environments as closed control volumes governed by strict Dirichlet boundary conditions.
- Squaring the Schrödinger Equation: Rather than relying on standard complex-number wave functions (Ψ), Abbas proposes squaring the Schrödinger partial differential equation directly. This yields the quantum energy density as a real, tangible physical quantity ($\Psi^2 = \Psi \cdot \Psi^*$), aiming for a clearer physical interpretation.

Resolving "The Paradox"

Abbas uses his "New Physics" framework to challenge mainstream theoretical physics, arguing that mathematics

should remain a tool to describe nature rather than a generator of independent physical laws.

- Schrödinger's Cat: By shifting the quantum narrative to a "bounded statistical system," Abbas attempts to resolve the Schrödinger's cat paradox. His papers argue that traditional paradoxes arise because physicists treat systems as infinitely open; accounting for physical constraints and information loss within a bounded environment removes the mathematical absurdities.

- The "In-the-Box" Paradox: Referred to in his literature as a variant of "black magic" mathematical errors, Abbas attempts to prove that supposed physical singularities (like infinite energy density at the exact center of a solid sphere) do not physically exist and are merely limitations of standard calculus that his B-matrix chain technique avoids.

The "Cairo techniques" and the resulting reformulation of quantum mechanics aim to uncover hidden laws and provide a better account of information loss in open systems. The "Cairo techniques" constitute a four-dimensional (4D) unitary numerical statistical method that Abbas employs to reformulate quantum mechanics. They rely on transition chains and "B-Transition Matrices" to correct incomplete or misleading aspects of the Schrödinger equation, thereby enabling a more precise description of quantum energy distributions.

The content presented in this article [2–9]—which will be discussed in the second section under the heading "Theory and Numerical Applications"—revolves around six fundamental and pressing questions, along with their corresponding answers:

1- Is it true that the sum of the Fourier transform of a function and its inverse must be a constant value?

2- What happens when a display screen is moved from computer A to computer B, or vice versa?

3- What is the "Cairo Paradox" number 3?

4- What are the units of measurement in the Fourier transform compared to those of the "Cairo transform"?

5- Is the classic example of "Schrödinger's cat" inside a box considered a paradox?

6- Is the expansion of vacuum energy density—which triggered the Big Bang billions of years ago—considered a paradox?

An interesting explanation of the "Cairo techniques" theory can be found in reference no. 1;

these techniques—alongside a new formulation of quantum mechanics—aim to uncover hidden laws and improve how the loss of information in open systems is addressed.

This is a 4D unitary numerical statistical method that Abbas uses to reformulate quantum mechanics. It involves transition chains and B-Transition Matrices to correct incomplete or

misleading aspects of the Schrödinger equation, allowing for a more precise description of quantum energy distributions

He has developed a series of theoretical frameworks aimed at addressing the perceived limitations within classical and quantum physics. His work emphasizes that, while traditional mathematics has served as a tool in physics, it cannot be assumed that mathematics itself generates new physical laws; rather, he argues that physics can reveal new mathematical structures through statistical and unitary approaches. Key concepts of Abbas's "new physics" include: 1. Bounded statistical systems: Abbas introduces the concept of a "bounded statistical system," defined as a closed control volume subject to Dirichlet boundary conditions. This framework is applied to help resolve paradoxes—such as Schrödinger's cat—potentially paving the way for a unified framework. 5. Discovery of hidden laws: Abbas asserts that thousands of intrinsic laws and rules—pertaining to physics, mathematics, and biochemistry—remain unknown. His methods aim to systematically uncover these hidden structures by employing statistical and unitary approaches. Implications:

Abbas's In all six questions mentioned above—which cover a diverse range of topics in physics and mathematics—we demonstrate precisely how to construct an answer using a fundamental pillar of nature: the "statistical transition matrix" (B). We also show how to uncover new rules and theorems

inherent to physics and mathematics, as well as new paradoxes. It should be noted that the "energy density curvature matrix" U(x, y, z, t)—presented in Equation 1*—is equivalent to the "transport matrix" D(N), which can be expressed in terms of the statistical transition matrix B(x, y, z, t) as follows [2-20]:

$D(N) = B + B^2 + B^3 + \ldots + B\text{^}N$. . . . (2)

Equation 2 demonstrates that the statistical transition matrix B serves as the cornerstone, or foundation, upon which this new physics and mathematics are built.

Contributions are primarily theoretical; they offer a new mathematical and physical perspective for understanding quantum phenomena, energy distributions, and the interactions between classical physics and relativistic physics. His work challenges established postulates and suggests alternative formulations that could refine or extend current physical models. In short, Ismail Abbas's "new physics" is centered on the concept of bounded statistical systems.

The "Cairo techniques" and the resulting reformulation of quantum mechanics aim to uncover hidden laws and provide a better account of information loss in open systems. The "Cairo techniques" constitute a four-dimensional (4D) unitary numerical statistical method that Abbas employs to reformulate quantum mechanics. They rely on transition chains and "B-Transition Matrices" to correct incomplete or misleading aspects of the Schrödinger equation, thereby

enabling a more precise description of quantum energy distributions.

It should also be noted that, as of today, we are aware of only two types of transition matrices: the well-known Markovian statistical transition matrix M, and the proposed statistical transition matrix B—the latter of which demonstrates clear advantages. Furthermore, it is worth noting that the quantum statistical transition matrix developed by W. Heisenberg, Max Born, and Pascual Jordan in 1925 (the HMJ theory) is neither a transition matrix nor a statistical matrix.

E(N) = 1/(I-B) . . . (4).

Equation 4 leads to:

D(N) = 1/(I-B) - I . . . (5),

a relationship that holds for sufficiently large values of N.

To this, the term B^N · U(x, y, z, t=0) . . . (6) is added. However, we neglect the term $B^N \cdot U(x, y, z, t=0)$, as it approaches zero when N tends to infinity, given that the norm of the matrix B is less than one.

Equation 6 indicates that after N successive time steps, we obtain:

U(x, y, z, Ndt) = D(N) U(x, y, z, t=0) + B^N · (b+S) . . . (7).

It is worth noting again that B^N approaches zero as N tends to infinity, because the norm of the matrix B is less than one.

It should also be noted that Equation 7 is equivalent to Equation 1*, which describes and applies to the entire fields of physics and mathematics. It is worth mentioning here that Equation 1*—the most significant equation in physics and mathematics—is not merely an assumption; its counterparts

(Equations 2–5) are based on precise definitions and derivations, and they have been successfully applied across all branches of physics and mathematics since 2020 [13, 2–12]. The universal laws of physics are: 1) the Pythagorean theorem, 2) the conservation of energy, 3) symmetry and commutativity, and 4) the Lorentz transformations.

It should also be noted that Equation 7 is equivalent to Equation 1*, which describes and applies to the entire fields of physics and mathematics. It is worth mentioning here that Equation 1*—the most significant equation in physics and mathematics—is not merely an assumption.

In other words, it is worth noting that the most significant equation in physics and mathematics is not merely an isolated case; rather, it—along with its related formulas—forms part of a broader context.

(Equations 2-5) have a rigorous definition and derivation, and both have also been successfully applied in all fields of physics and mathematics since 2020 [13,2-12].The authors predict that the new physics based on and defining the curvature of space-

time, Equation 1*, should exactly describe all of nature (mathematics, classical and quantum physics, as well as probability and statistics) and should therefore meet the following conditions and or the universal laws of physics:

1-Pythagorian theorem.

2-Energy conservation.

3-symmetry and reciprocity.

4-Lorentz transformation.

The four condition above implies that time should be discrete not continuum [14,15].

Moreover, the above four conditions i-iv implies the existence of a transition matrix B controlling the spatial-temporal evolution of the energy density U in the form:b and S are the vector of boundary conditions and the vector ofthe source term arranged in the right order [2-14].Note that the statistical transition matrix must meet the aboveconditions [2-14,15]

The physical meaning of equation 7 is that the space-time interval dx dy dz dt is conserved under motion AND the boundary conditions vector b cannot be distinguished from the external source term S at any space-time point x,y,z,t

Properties of statistical transition matrix B

The sum of B i, j = 1 for all the rows far from the borders and the sum B i, j <1 for all the rows connected to the borders meaning that the probability of the whole space = 1.

Obviously and again, the statistical matrix B is very different from the Laplace mathematical matrix A and from the Marko transition matrix M.

The physical nature of B is clear and briefly explained above through conditions I to iv which support hypothesis 3.The only difficulty or complexity related to determining the B-matrix input elements in classical physics and the Q matrix in quantum physics emerge from the process of pre-selecting the main diagonal elements (Bii or RO),since this arbitrary choice is function of the nature of the problem under consideration and its physical characteristics. However, the main diagonal elements of the transition matrix B can also be well defined depending on the nature of the container's environment, as follows:

For example:

i-Bii = 0 for mathematical and electromagnetic problems.

ii- Bii = 0.2 and 0.22 for the partial differential equation (PDE)governing heat diffusion in low-carbon Russian alloy steel and high-quality Egyptian aluminum, respectively. And so on.

Note that, Improved knowledge and understanding of how to construct correct and efficient software algorithms using current programming languages, such as Fortran and C++are

well explained in references [16-20,21,22,25,26,27,30,31,32,32*].

On the other hand, mastery of matrix algebra operations, such as calculating eigenvalues and eigenvectors, as well as matrix multiplication, addition, inversion, and others are well explained in references [16-20,22,28,29,30].To avoid getting bogged down in the introduction, let's move directly to the second section,

II-Theory and Numerical Applications

In this section on theory and numerical applications, we present and explain the following six topics in a question-and-answer format:

Q1-

Is it true that the sum of the Fourier transform of a function and its inverse must be a constant value?

A1

It is true that The Fourier transform of a function plus its inverse must be constant if the function is piecewise continuous on every interval.

The question arises if this rule or theorem exists and implied by the Golden equation 1* proposed by the author?

The answer is yes.

Cairo's statistical theory of techniques introduces some well-defined paradoxes like unexpected theorems or rules, meaning an empirical universal fact that can neither be

theoretically nor mathematically proven or disproven. In fact, Cairo's techniques generate two series of transition matrices:

1- B- transition matrix used for solving problems in mathematics, electromagnetic field problems, and classical physics problems like the heat diffusion equation.

2- Q- transition matrix used to solve situations in quantum mechanics. It's clear that Q = SQRT(B); Cairo's paradox number 2 deals with the square root of the transition matrix B, which should be unique, continuous, finite, and integrable. [It indicates that the matrix Q exists only for a two-dimensional B matrix]

3-It is true that The Fourier transform of a function plus its inverse must be constant if the function is piecewise continuous on every interval. efc..

4-The origin of all physics and mathematics which is called new physics is the golden equation that the author presented in 2020, 2025, and 2026 [1,2,3]:

U(x,y,z,t(N))=D(N) D* (b+S) + B*N (U(x,y,z,t=0)) . . . . (1*)

Equation 1* is called golden equation because it is able to solve all problems of physics and mathematic and additionally generate new rules and theorems.

In other words Eq 1* is the theory of every thing and is the true AI by itself.

It is clear that the nature represented by eq 1* does not distinguish between the boundary conditions vector b and the energy density source term vector S .

b vector can be transformed into S vector which is called by mathematician's Fourier transform.

And S vector can be transformed into V which is called by mathematicians inverse Fourier transform.

Conclusion is that Fourier transform if exists must have an inverse and that both Fourier transform and its inverse are physical quantities not mathematical ones

Q2- What happens when a display screen is moved from computer A to computer B, or vice versa?

A2-

It may come as a surprise, but when a monitor (or display screen) is moved from computer A to computer B (or vice versa), the information present on computer A is transferred to computer B; the same principle applies in the opposite direction.

When a monitor is moved from computer A to computer B, the monitor itself does store or transfer any data; similarly, computer B automatically detects this hardware change, displays content on the monitor, and assumes full control over it.

It is worth noting that this simple experiment can be conducted by any physicist or mathematician who has two separate computers.

Q3-

What is the "Cairo Paradox" number 3?

A3-

The statistical theory of "Cairo techniques" presents several paradoxes—defined precisely as theorems or rules—that run counter to logical expectations.

The Cairo paradox: by its very nature, it resembles an empirical universal law that can neither be proven nor refuted through theoretical or mathematical means.

Cairo Paradox No. 3 concerns the relationship between the Schrodinger partial differential equation (Schrodinger PDE) and the heat diffusion equation.

This paradox states that:

[The Schrodinger partial differential equation is, in reality, the square root of heat diffusion (energy density) in a vacuum.]

Q4-

What are the units of measurement in the Fourier transform compared to those of the "Cairo transform"?

A4-

The units of the Fourier transform are expressed in "volt , seconds" or "volts per hertz."

In contrast, the units of the Cairo transform are expressed in terms of "energy density × time."

This shows, in a sense, that the Cairo transform is more general than the Fourier transform.

Q5-

Is the classic example of "Schrödinger's cat" inside a box considered a paradox?

A5-

- the classic example of "Schrödinger's cat" inside a box is not a paradox; it can be resolved statistically by incorporating the time element (t)—where t belongs to the interval $[0, \infty)$—into the problem.

Q6-

the expansion of vacuum energy density—which triggered the Big Bang billions of years ago (a phenomenon that, at first glance, appears to contradict quantum mechanics)—is not a paradox; is it a paradox?

A6-

This does not represent a paradox. The expansion of vacuum energy density can be demonstrated and calculated statistically using Equation 7*, provided that the time component (t)—where t belongs to the interval $[0, \infty)$—as included in the analysis.

III-CONCLUSION

The current study shows that the same statistical transition matrix B and equation 1* solve all types of mathematical and physical situations.

Needless to say, this is a sort of unifying physics and mathematics.

The authors describe equation 1* as the golden equation because it solves all physical and mathematical problems.

This article serves to verify the statement mentioned above by providing accurate and correct answers to six relevant questions:

1- Is it true that the sum of the Fourier transform of a function and its inverse must be a constant value?

2- What happens when a display screen is moved from computer A to computer B, or vice versa?

3- What is the "Cairo Paradox" number 3?

4- What are the units of measurement in the Fourier transform compared to those of the "Cairo transform"?

5- the classic example of "Schrödinger's cat" inside a box is not a paradox; it can be resolved statistically by incorporating the time element (t)—where t belongs to the interval $[0, \infty)$—into the problem.

6- the expansion of vacuum energy density—which triggered the Big Bang billions of years ago (a phenomenon that, at first glance, appears to contradict quantum mechanics)—is not a paradox; is it a paradox?

it can be demonstrated and calculated statistically using Equation 7*, provided that the time element (t)—where t belongs to the interval $[0, \infty)$—is included in the analysis.We introduce and define the Cairo paradox as an empirical fact that cannot be proven or disproven theoretically or mathematically.

Accordingly, the classic example of "Schrödinger's cat" inside a box is not a paradox; it can be resolved statistically by incorporating the time element (t)—where t belongs to the interval $[0, \infty)$—into the problem.

Similarly, the expansion of vacuum energy density—which triggered the Big Bang billions of years ago (a phenomenon that, at first glance, appears to contradict quantum mechanics)—is not a paradox; it can be demonstrated and calculated statistically using Equation 7*, provided

that the time element (t)—where t belongs to the interval $[0, \infty)$—is included in the analysis.

Finally, the authors recall that the proposed article claim mentioned in the title is just a small step on a long road and that sooner or later it will prevail over today's classical science.

It is worth mention to note again that this article does not aim to diminish the significant contributions of great physicists and mathematicians such as A. Einstein, C. Maxwell, E. Schrödinger, N.Bohr, E. Heisenberg, Murkowski, Hilbert, Riemann, among others, but rather to address the most prominent shortcomings and limitations of their theories, where applicable.

Note I: It is best to be familiar with the general laws of physics as presented in reliable scientific references; otherwise, you will find this article extremely difficult to read.

Note II: In the previous calculations, the author used his own double precision algorithm in Fortran language as explained in ref. 29,31,32.

No ready-made algorithms such as Python or MATLAB are required.

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During this long experience, he went to the Atomic and Nuclear Physics Center in Toulouse, France, where he earned his PhD and worked as a professor at ULP and UPS universities, as well as a research director at CNRS in France. The latest experience, like the first, was an opportunity to collaborate with top leaders and the latest scientific knowledge.

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