

## How to generate new mathematics-Part III

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### Abstract

***Mathematics entered physics as a tool but little by little it transformed to be the master.***

In previous articles entitled How to Generate New Mathematics - Parts I and II we discussed how to apply the statistical theory of Cairo techniques to generate new laws and rules in most fields of classical and quantum physics, statistics, and pure mathematics.

In this article, we use the same theory to extend the previous statistical analysis by addressing the extremely important and urgent six questions:

1-Is it true that nature is intrinsically statistical and that a statistical system must necessarily be bounded?

2- What is the intelligent matrix?

3-What is negative diffusion?

4- How to master the theory of a nuclear power plant reactor and the standard size of the Hiroshima nuclear bomb, while ensuring that neither turns into the other?

5- What are the similarities between Markov chains and the Cairo techniques transition chains?

6- Is there a similarity between the pufferfish habitat and that of aerobic bacteria?

The different applications in the new unitary discrete xyzt space of the Cairo techniques shows that there are thousands of hidden intrinsic laws and rules in physics, mathematics, and even biochemistry, waiting to be discovered.

This striking fact is the subject of this article.

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 for you.***

## I. INTRODUCTION

***Mathematics entered physics as a tool but little by little it transformed to be the master.***

In the sense that most people mistakenly believe that mathematics can generate new physics, when it is actually quite the opposite.

In previous articles entitled How to Generate New Mathematics - Parts I and II we discussed how to apply the statistical theory of Cairo techniques to generate new laws and rules in all fields of classical and quantum physics, statistics, and pure mathematics.

In this article we use the same theory extend the previous analysis via answering the extremely important and pressing questions:

**1- Is it true that nature is intrinsically statistical and that a statistical system must necessarily be bounded?**

**2- What is the intelligent matrix?**

**3-What is negative diffusion?**

**4- How to master the theory of a nuclear power plant reactor and the standard size of the Hiroshima nuclear bomb, while ensuring that neither turns into the other?**

**5- What are the similarities between Markov chains and the Cairo techniques transition chains?**

**6- Is there a similarity between the pufferfish habitat and that of aerobic bacteria?**

The applications and numerical results of this article shows that there are thousands of hidden intrinsic laws and rules in physics, mathematics, and even biochemistry, waiting to be discovered.

***This striking fact is the subject of this article.***

Specifically, the core of this article revolves around the following six issues:

***1-nature is intrinsically statistical and a statistical system must necessarily be bounded***

We believe that nature is intrinsically statistical and that a statistical system is necessarily bounded.

The bounded statistical system was introduced for the first time by the author as the closed control volume  $V$  enclosed by a closed surface  $A$  and subjected to Dirichlet boundary conditions in 2020.

This bounded statistical system is essential for describing both classical and quantum physics systems.

For example, In classical physics, the heating or cooling of a material object is limited by Dirichlet boundary conditions reservoir.

Quantum systems are also limited by appropriate boundary conditions.

Positive and negative diffusion are likewise limited.

The absence of well defined control volume not permitting external observation which is in away a sort of loss of information, is most likely the reason behind the failure of the Schrödinger paradox of the cat in a transparent box.

***Additionally, in Statistical Thermodynamics, when we talk about nature we have to define an ensemble, which can be open or close via boundary conditions and the constraints in this case are imposed on the thermodynamic observables.***

## **2- What is the intelligent matrix?**

*We introduce, define and explain a new square matrix called the intelligent matrix for both classical physics space and quantum physics world.*

*The physical definition of intelligent matrix is that matrix able to predict and explain the future of a classical/quantum physics system.*

*Quite striking, the intelligent matrix is able to tell you what will happen tomorrow.*

*It is by itself a theory of everything.*

*The intelligent matrix is rigorously defined mathematically as the REAL -transition matrix B which is again well defined by the author through the 4 statistical conditions in 2020.*

*In a similar way the complex intelligent transition matrix Q is well defined as:*

$$Q=\text{SQRT}(B)$$

## **3-What is negative diffusion?**

***Negative diffusion is the inverse of positive diffusion.***

In positive scattering of the energy density or mass of particles moves freely from areas of high concentration to areas of low concentration, while in negative scattering, the energy density or

mass of particles moves freely from areas of low concentration to areas of high concentration.

The Cairo technique predicts the existence of negative diffusion and negative diffusivity  $D$  simply by substituting a negative value for  $RO$  in the statistical transition matrix  $B$ .

It has been previously analyzed that the diffusivity  $D$  is equal to  $\text{Constant} \times RO$  [1,2,3], where  $RO$  corresponds to the elements of the main diagonal of  $B$ . This analysis allows for a rigorous definition of the microscopic diffusivity  $D$  in 1D, 2D, and 3D geometric spaces and, moreover, a better explanation of negative scattering as a macroscopic phenomenon [4,5,6]. This is fundamental to understanding the mathematical, physical, and chemical aspects of positive and negative diffusion.

The transition from microscopic transition matrices ( $B$ ) to a rigorous definition of negative diffusivity ( $D < 0$ ) is also intellectually stimulating.

From the perspective of Polymer Physics, our definition of 'negative scattering' as a macroscopic phenomenon provides a compelling mathematical framework for understanding Spinodal Decomposition.

In multi-component polymer systems, such as plasticized PVC, we often encounter 'up-hill diffusion' where the plasticizer or additives migrate from areas of low concentration to high concentration (clusters) due to thermodynamic instability.

#### **4- How to master the theory of a nuclear power plant reactor and the standard size of the Hiroshima nuclear bomb, while ensuring that neither turns into the other?**

**Both operate on the same principle: bombardment of U235 or Pu 238 with fast neutrons causes fission of those atoms and producing huge amount of thermal energy in addition to Alpha, Beta and Gamma radiations.**

In Nuclear reactor, the fuel in the form of yellowcake is contained in large, thick, hemispherical reinforced concrete towers, 1 to 2 meters thick

**These reinforced concrete towers absorb and reflect leaky neutrons, thus preventing the spread of this dangerous neutron radiation outside the power plant.**

*Furthermore, the chain reaction is controlled or limited to the required level by control rods.*

**These rods are made from metals or alloys that strongly absorb neutrons, such as cadmium and/or beryllium.**

**The insertion of these neutron-absorbing rods into the core of the fuel cake slows the reaction until it is completely shut down, corresponding to the total cessation of the chain reaction.**

**This is referred to as a complete shutdown.**

**In reality, it is the crucial balance between the insertion depth of the control rods and the forced flow of cooling water that is difficult to achieve and that was the primary cause of the Chernobyl disaster in Russia and the Fukushima disaster in Japan.**

**We assume that the catastrophic error made by the Russians and the Japanese was virtually identical.**

**They mistakenly assumed that the release of thermal energy and the overheating of the reactor core ceased almost instantly after a complete shutdown.**

**In fact, the release of thermal energy and the overheating of the reactor continue for several minutes after a complete shutdown.**

## **5- What are the similarities between Markov chains and the Cairo techniques transition chains?**

**Today we know only two transition matrices and two matrix chains:**

i-Markov transition matrix and Markov transition matrix chains.

ii-The B-transition matrix resulting from the Cairo techniques and the B-transition matrix chains.

Markov matrix  $M_{n \times n}$  is a non-negative real square matrix subject to a statistical condition,

$\sum M_{i,j} = 1$  for all lines  $i$ ,

Or  $\sum M_{i,j} = 1$  for all columns  $j$ ,

### ***6- Is there a similarity between the pufferfish habitat and that of aerobic bacteria?***

*There is a striking similarity between the habitat of the pufferfish and that of aerobic bacteria.*

*that astonishing similarity between the pufferfish habitat and that of aerobic bacteria can be observed experimentally and justified theoretically through electric and magnetic field of Maxwell theory.*

*This is explained in Section II Theory.*

## **II.Theory**

**The core of this article is the discretization definition of time  $t$  described in the statistical theory of Cairo techniques:**

**1-** Some people argue that:

i- Einstein's law of gravity does not include time.

ii- Einstein once said that time is an illusion, or what you'll find in a Google search and on Wikipedia is: Time is an illusion (and Einstein knew it).

The answer is simple: Einstein's law of gravitation does not take time into account. But that is why Einstein's demonstrations and conclusions in general relativity are catastrophically wrong.

iii-We would like to emphasize a very simple but fundamental point: **time is not an illusion**, because without time no operation — physical or mathematical — can exist.

Even the simplest mathematical operation, such as:

$$2 + 2 = 4$$

requires a minimal temporal unit

**2-**A clear and simple start to combine equations 1,2,3 below to form one version of the theory of Cairo techniques is to start by the Cauchy Riemann tensor in 3D geometrical space [7,8,9].

*Note that We assume that the real physical definition of time is not a scalar but a 4 component vector  $t_{xx}, t_{yy}, t_{yz}, t_t$  [10,11,12,13]*

**3-Moreover the time  $t$  must be correctly defined via the following rules,**

i-Nature is Lorentzian and time also must be Lorentzian, ie,  $dx dt = dx^* dt^*$

ii-Time is infinite and exponential meaning,

$$U(t)=U(0)\exp - D^* t$$

leading to,

$$U(0)-U(t)=U(0)/U(t), \dots (1)$$

**And,**

$$U(t)=U(0)\text{Exp} (-D^*t) \dots (2)$$

where  $U(t)$  and  $U(0)$  is the energy density, not necessarily be gravity energy density.

iii-Nature space-time is Pythagoras,ie,

$$X^2+Y^2+Z^2+C^2 t^2 =\text{constant}, \dots (3)$$

**AND NOT,**

$$X^2+Y^2 + Y^2 -C^2 t^2=0 \dots\dots (4)$$

**We assume that equation 4 is the most stupid space/theory in history,**

Equation 4 is called Riemann space which is a SATANIC TRAP , but since the time Einstein and Partially Schrodinger fell in this trap it became the NORM.

Note that equations 1,2 and 3 provide a rigorous definition for time t.

It is clear that the only theory satisfying the above conditions for time space is the statistical theory of Cairo Techniques and Markov transition matrix chains.

Needless to say that statistical theory of Cairo Techniques is an improvement of Markov transition matrix chains [14,15].

**Cairo techniques is Best by Test.**

**The question arises as how to combine equations 1,2 to obtain a rigorous formula of the Cairo techniques?**

One simple and clear path is to start by the Cauchy Riemann tensor in 3D geometric space.

The Cauchy Riemann stress tensor in 3D geometrical space:

Fxx Fxy Fxz

Fyx Fyy Fyz

Fzx Fzy Fzz

when it is generalized in the 4D unit space xyz t where time is included as a vector with 4 components txx, tyy, tzz, tt, it becomes,

Fxx Fxy Fxz Fxt

Fyx Fyy Fyz Fyt

$F_{zx} F_{zy} F_{zz} F_{zt}$

$F_{tx} F_{ty} F_{tz} F_{tt}$

We call it M1.

When multiplying M1 by the appropriate definition of the strain or curvature tensor M2 expressed as,

$C_{xx} C_{xy} C_{xz} C_{xt}$

$C_{yx} C_{yy} C_{yz} C_{yt}$

$C_{zx} C_{zy} C_{zz} C_{zt}$

$C_{tx} C_{ty} C_{tz} C_{tt}$

and equate the multiplication to the unit matrix I, we get,

$$M1 M2 = I \dots (5)$$

Using equation 5, you can derive all the laws of physics and mathematics, including Schrödinger's QM equation and Einstein's general relativity, in one sentence.

Note that,

$$C_{xy} = d^2/dx dy \dots \text{etc and } F_{xy} = d^2 U/dx dy \dots \text{etc.}$$

*Note also that equation 5 represents the conservation of unitary 4D xyz t space under motion which is the general case of Lorentz transformation.*

Therefore, we propose a more correct and accurate spatiotemporal energy density matrix/tensor that conforms to equation 5 given by:

$$\nabla^2_{xx} \nabla^2_{xy} \nabla^2_{xz} \nabla^2_{xt} ] U(x,y,z,t)$$

$$\nabla^2_{yx} \nabla^2_{yy} \nabla^2_{yz} \nabla^2_{yt} ] U(x,y,z,t)$$

$$\nabla^2_{zx} \nabla^2_{zy} \nabla^2_{zz} \nabla^2_{zt} ] U(x,y,z,t)$$

$$\nabla^2_{tx} \nabla^2_{ty} \nabla^2_{tz} \nabla^2_{tt} ] U(x,y,z,t)$$

Where  $\nabla^2 xy = d^2/dx dy) \text{partial}$ ,  $\nabla^2 tz = d^2/dt dz) \text{partial}$   
,  $\nabla^2 tt = d^2/dt^2) \text{partial}$  . .etc.

We call the previous Cairo tensor matrix M1.

2-We again propose another more accurate spatio-temporal deformation or curvature matrix/tensor given by

Cxy Cxy Cxz Cxt

Cyx Cyy Cyz Cyt

Czx Czy Czz Czt

Ctx Cty Ctz Ctt

We call this matrix M2

Where,

$Cxy = dx dy / xy$ ,  $Cyy = dy^2 / y^2$ ,  $Ctz = dt dz / tz$  . .etc.

3- We apply the universal physical Lorentz transformation law expressed as  $M1 * M2 = I$  in a 4-dimensional unitary xyzt space,

$M1 * M2 = I \dots (6)$

Where I is the unit matrix.

Equation 6 is itself the law of general relativity or the conservation of the spacetime element xyzt implied by the Lorentz universal transformation law.

It is worth mention that there are extra explanatory text books for the above operations in matrix algebra such as references 18,19.

So we now have two distinct theories of general relativity mec:

one based on the original 1915 theory of A. Einstein stress strain tensor equation, and the other based on the author stress strain tensor equation.

iii- An important property of the energy density field is that any kinetic energy density field induces a curvature of space-time, similar to that which the theory of general relativity explains by gravitational energy, stresses, and space-time deformations.

Einstein mistakenly believed that this theory was exclusively linked to the force of gravity.

4. Einstein failed to prove that special relativity is a special case of general relativity by simply eliminating acceleration.

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4. Einstein failed to prove that special relativity is a special case of general relativity of equation 5 by simply keeping  $x$  and  $t$  derivatives and eliminating  $y, z$  ones.

***In order not to worry too much about the details of the theory, let's move directly to Section III on applications and numerical results.***

### III.Applications and Numerical Results

In this section III of Applications and Numerical Results we will use the method of questions and answers for clarity.

#### Q1

**Is it true that nature is intrinsically statistical and that a statistical system must necessarily be bounded?**

#### A1

Most physicists and mathematicians believe wrongly that the circular symmetry  $\pi$  and  $\sqrt{2}$  are two mathematical constants without statistical or physical meaning.

The constant  $\pi$  appears frequently in classical physics even if the system has no circular symmetry and  $\sqrt{2}$  appears in quantum physics without knowing how and why.

***We believe that  $\pi$  and  $\sqrt{2}$  are two universal constants of physics that show that nature is, in itself, a statistical system.***

Now, assuming that the system's rise/fall time has exponential stability,  $U(t) = U(0) \cdot \text{Exp}(-\text{Alpha} \cdot N \cdot t)$  and that the average area absorption of the limited system's internal walls is  $A$ ,

A striking statement appears,

$$\text{Alpha} \cdot A \cdot (n + 1)^2 = 6.28 = 2 \pi \dots \dots \dots (1)$$

for all cubes of different n, A.

Equation 1 is equivalent to Sabine's formula for the reverberation time in audio rooms [21,22].

The statistical significance of equation 1 is that the rate of energy dissipation per unit dU/dt of a system is equal to 2 Pi times its total energy U for any geometry.

Finally, we can borrow the quote from the great scientist N. Bohr without modification:

**"Anyone who thinks they can talk about quantum mechanics QM and / or classical statistical mechanics CSM "without being dizzy has not yet understood the first word"**

Second wrt  $\sqrt{2}$  we proceed as follows:

for the equidistant 8 free nodes cube,

B 8x8=

0 1/6 0 1/6 1/6 0 0 0

1/6 0 1/6 0 0 1/6 0 0

0 1/6 0 1/6 0 0 1/6 0

1/6 0 1/6 0 0 0 0 1/6

1/6 0 0 0 0 1/6 0 1/6

0 1/6 0 0 1/6 0 1/6 0

0 0 1/6 0 0 1/6 0 1/6

0 0 0 1/6 1/6 0 1/6 0

**The quantum mechanics' is not complicated but it needs a hell of concentration.**

*The breakthrough to quantum mechanics interpretation is that its complex transition matrix Q exists and equals the square root of the classical mechanics B-transition matrix .*

Therefore, the complex quantum transition matrix  $Q_{8 \times 8} =$

$$\begin{pmatrix} \frac{(1+i) \cdot 2^{0.5} + (1+i) \cdot 6^{0.5}}{16} & \frac{(3-3i) \cdot 2^{0.5} + (1-i) \cdot 6^{0.5}}{48} & & & & & & \\ \frac{(3+3i) \cdot 2^{0.5} - (1+i) \cdot 6^{0.5}}{48} & \frac{(3-3i) \cdot 2^{0.5} + (1-i) \cdot 6^{0.5}}{48} & & & & & & \\ \frac{(3-3i) \cdot 2^{0.5} + (1-i) \cdot 6^{0.5}}{48} & \frac{(3+3i) \cdot 2^{0.5} - (1+i) \cdot 6^{0.5}}{48} & & & & & & \\ \frac{(1-i) \cdot 2^{0.5} - (1-i) \cdot 6^{0.5}}{16} & \frac{(3+3i) \cdot 2^{0.5} - (1+i) \cdot 6^{0.5}}{48} & & & & & & \\ \frac{(3-3i) \cdot 2^{0.5} + (1-i) \cdot 6^{0.5}}{48} & \frac{(1+i) \cdot 2^{0.5} + (1+i) \cdot 6^{0.5}}{16} & & & & & & \\ \frac{(3-3i) \cdot 2^{0.5} + (1-i) \cdot 6^{0.5}}{48} & \frac{(3+3i) \cdot 2^{0.5} - (1+i) \cdot 6^{0.5}}{48} & & & & & & \\ \frac{(3+3i) \cdot 2^{0.5} - (1+i) \cdot 6^{0.5}}{48} & \frac{(3-3i) \cdot 2^{0.5} + (1-i) \cdot 6^{0.5}}{48} & & & & & & \\ \frac{(3+3i) \cdot 2^{0.5} - (1+i) \cdot 6^{0.5}}{48} & \frac{(1-i) \cdot 2^{0.5} - (1-i) \cdot 6^{0.5}}{16} & & & & & & \\ \frac{(3+3i) \cdot 2^{0.5} - (1+i) \cdot 6^{0.5}}{48} & \frac{(3-3i) \cdot 2^{0.5} + (1-i) \cdot 6^{0.5}}{48} & & & & & & \\ \frac{(1+i) \cdot 2^{0.5} + (1+i) \cdot 6^{0.5}}{16} & \frac{(3-3i) \cdot 2^{0.5} + (1-i) \cdot 6^{0.5}}{48} & & & & & & \\ \frac{(1-i) \cdot 2^{0.5} - (1-i) \cdot 6^{0.5}}{16} & \frac{(3+3i) \cdot 2^{0.5} - (1+i) \cdot 6^{0.5}}{48} & & & & & & \\ \frac{(3-3i) \cdot 2^{0.5} + (1-i) \cdot 6^{0.5}}{48} & \frac{(3+3i) \cdot 2^{0.5} - (1+i) \cdot 6^{0.5}}{48} & & & & & & \\ \frac{(3-3i) \cdot 2^{0.5} + (1-i) \cdot 6^{0.5}}{48} & \frac{(1+i) \cdot 2^{0.5} + (1+i) \cdot 6^{0.5}}{16} & & & & & & \\ \frac{(3+3i) \cdot 2^{0.5} - (1+i) \cdot 6^{0.5}}{48} & \frac{(1-i) \cdot 2^{0.5} - (1-i) \cdot 6^{0.5}}{16} & & & & & & \\ \frac{(3+3i) \cdot 2^{0.5} - (1+i) \cdot 6^{0.5}}{48} & \frac{(3-3i) \cdot 2^{0.5} + (1-i) \cdot 6^{0.5}}{48} & & & & & & \\ \frac{(3-3i) \cdot 2^{0.5} + (1-i) \cdot 6^{0.5}}{48} & \frac{(3+3i) \cdot 2^{0.5} - (1+i) \cdot 6^{0.5}}{48} & & & & & & \\ \frac{(1-i) \cdot 2^{0.5} - (1-i) \cdot 6^{0.5}}{16} & \frac{(3+3i) \cdot 2^{0.5} - (1+i) \cdot 6^{0.5}}{48} & & & & & & \\ \frac{(3-3i) \cdot 2^{0.5} + (1-i) \cdot 6^{0.5}}{48} & \frac{(3+3i) \cdot 2^{0.5} - (1+i) \cdot 6^{0.5}}{48} & & & & & & \end{pmatrix}$$



$$\begin{aligned}
 & (1+i) \cdot 2^{0.5} + (1-i) \cdot 6^{0.5} / 16 \quad ((-3-3i) \cdot 2^{0.5} + (1+i) \cdot 6^{0.5}) / 48 \quad ((-3+3i) \cdot 2^{0.5} - (1-i) \cdot 6^{0.5}) / 48 \\
 & ((-3-3i) \cdot 2^{0.5} + (1+i) \cdot 6^{0.5}) / 48 \quad ((-3+3i) \cdot 2^{0.5} - (1-i) \cdot 6^{0.5}) / 48 \quad ((-1-i) \cdot 2^{0.5} - (1+i) \cdot 6^{0.5}) / 16 \\
 & ((-3+3i) \cdot 2^{0.5} - (1-i) \cdot 6^{0.5}) / 48 \quad ((-3-3i) \cdot 2^{0.5} + (1+i) \cdot 6^{0.5}) / 48 \quad ((-1+i) \cdot 2^{0.5} + (1-i) \cdot 6^{0.5}) / 16 \\
 & ((-3+3i) \cdot 2^{0.5} + (1+i) \cdot 6^{0.5}) / 48 \quad ((-3+3i) \cdot 2^{0.5} - (1-i) \cdot 6^{0.5}) / 48 \quad ((-3+3i) \cdot 2^{0.5} - (1-i) \cdot 6^{0.5}) / 48 \\
 & ((-3-3i) \cdot 2^{0.5} + (1+i) \cdot 6^{0.5}) / 48 \quad ((-1-i) \cdot 2^{0.5} - (1+i) \cdot 6^{0.5}) / 16
 \end{aligned}$$

**For sufficiently large number of time steps dt.**

***Note that  $2^{0.5}$  appears in the matrix  $QD(N)$  everywhere, and it will be natural for it to also appear in the solution of the QM systems.***

*Note also that we use the bounded 3D transition B-matrix chains to obtain a numerical value for the mathematical constant  $\pi$  and we use the bounded 3D complex transition Q-matrix chains to obtain a numerical value for the mathematical constant  $2^{0.5}$ .*

*This will be a numerical evidence that nature is intrinsically statistical and that a statistical system must necessarily be bounded .*

## Q2

**What is the intelligent matrix?**

## A2

We introduce, define and explain a new matrix called the intelligent matrix for both classical physics space and quantum physics world.

The physical definition of intelligent matrix is that matrix able to predict and explain the future of a classical/quantum physics system.

In other words the intelligent matrix is able to tell you what will happen tomorrow.

It is by itself a theory of everything.

The intelligent matrix is rigorously defined mathematically as the REAL -transition matrix B which is again well defined by the author through the 4 statistical conditions in 2020.

In a similar way the complex intelligent transition matrix Q is well defined as:

$$Q=\text{SQRT}(B)$$

### Q3

#### What is negative diffusion?

### A3

***Negative diffusion is the inverse of positive diffusion.***

Species move in a way that increases concentration differences instead of smoothing them, due to chemical free energy effects or reactions.

In positive scattering, the energy density or mass of particles moves freely from areas of high concentration to areas of low concentration, while in negative scattering, the energy density or mass of particles moves freely from areas of low concentration to areas of high concentration.

The Cairo techniques predicts the existence of negative diffusion and negative diffusivity D simply by substituting a negative value for RO in the statistical transition matrix B.

It has been previously analyzed that the diffusivity D is equal to Constant  $\times$  RO [1,2,3,23], where RO corresponds to the elements of the main diagonal of B.

This analysis allows for a rigorous definition of the microscopic diffusivity  $D$  in 1D, 2D, and 3D geometric spaces and, moreover, a better explanation of negative scattering as a macroscopic phenomenon [23,24,25,26].

This is fundamental to understanding the mathematical, physical, and chemical aspects of positive and negative diffusion.

From the perspective of Polymer Physics, your definition of 'negative scattering' as a macroscopic phenomenon provides a compelling mathematical framework for understanding Spinodal Decomposition. In multi-component polymer systems, such as plasticized PVC, we often encounter 'up-hill diffusion' where the plasticizer or additives migrate from areas of low concentration to high concentration (clusters) due to thermodynamic instability.

This occurs when the second derivative of the Gibbs free energy of mixing becomes negative, leading to a negative diffusion coefficient.

It should be noted that the statistical transition matrix  $B_{27 \times 27}$  for a negative diffusion such as  $RO = -0.2$  EXIST and is numerically well-defined and that the stationary solution follows from the transfer matrix  $D^-$ , exists and is stable:

$D^- =$

-137279/1877344 131825/704004 73895/1877344 131825/704004  
73895/938672 68945/2816016 73895/1877344 68945/2816016  
54155/5632032 525905/2816016 73725/938672 4915/201144  
73725/938672 4915/100572 54065/2816016 4915/201144  
54065/2816016 24575/2816016 68655/1877344 67415/2816016  
53555/5632032 67415/2816016 53555/2816016 3055/352002  
53555/5632032 3055/352002 24485/5632032

etc . .

Note that  $D^+$  and  $D^-$  are both double statistical matrices and can be completed using this property.

It is surprising to note that multiplying  $D^+$  by any initial conditions vector  $IC$  smooths the concentration energy density.

And multiplying  $D^-$  by any initial conditions vector  $IC$  creates and accentuates the concentration energy density.

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#### Q4

**How to master the theory of a nuclear power plant reactor and the standard size of the Hiroshima nuclear bomb, while ensuring that neither turns into the other?**

#### A5

**The disaster that happened in Chernobyl reactor in Russia and the Fukushima reactor in Japan was not nuclear explosion but extreme over heating and melting of the reactor core to the ground.**

In Nuclear reactors, the fuel (yellowcake) is contained in large, thick, hemispherical reinforced concrete towers, 1 to 2 meters thick. These reinforced concrete towers absorb and reflect leaky neutrons, thus preventing the spread of this dangerous neutron radiation outside the power plant. Furthermore, the chain reaction is controlled or limited to the required level by control rods. These rods are made of metals or alloys that strongly absorb neutrons, such as cadmium and/or beryllium.

The insertion of these neutron-absorbing rods into the core of the fuel cake slows the reaction until it is completely shut down, corresponding to the total cessation of the chain reaction.

This is referred to as a complete shutdown.

In reality, it is the crucial balance between the insertion depth of the control rods and the forced flow of cooling water that is difficult to achieve and that was the primary cause of the Chernobyl disaster in Russia and the Fukushima disaster in Japan.

We assume that the catastrophic error made by the Russians and the Japanese was virtually identical. They mistakenly assumed that the release of thermal energy and the overheating of the reactor core ceased almost instantly after a complete shutdown. In fact, the release of thermal energy and the overheating of the reactor continue for several minutes after a complete shutdown photos.1,2.

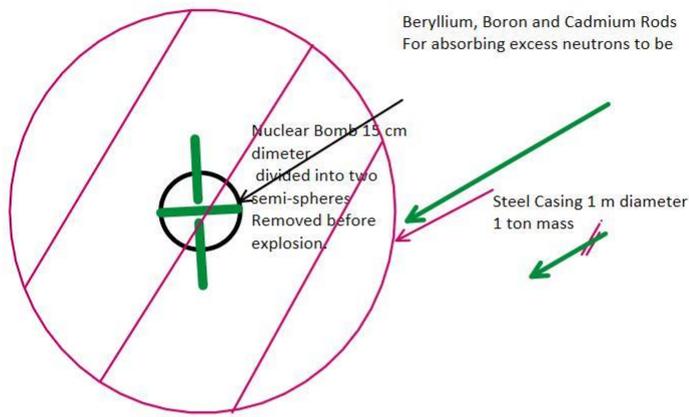
The photos below show the black smoke from the Chernobyl fire and that from the Fukushima fire.

On the other hand, in modern nuclear bombs of Hirushima standard (20 Mega ton TNT equivalence) the geometry is the reverse of that of nuclear reactor:

Sphere of 10-15 cm diagonal split into two halves and fitted with suitable control rods..

The concentration of the fuel, U235 or Pu 238 is between extremely high 90 and 95%.

The mass of the bomb itself is between 10 and 15 kg but it should be contained in 1 Ton of steel for radiation protection as shown in Fig.1.



A standard-size  
diagram of the  
Hiroshima nuclear  
bomb

**Fig.1. Nuclear bomb with a diameter of 15 cm divided into two hemispheres, removed before the explosion. 1-ton steel casing.**

Fig. 1 shows a standard-size diagram of the Hiroshima nuclear bomb, with an explosive power equivalent to 20 megatons of TNT..

**Q6**

**Is there a similarity between the pufferfish habitat and that of aerobic bacteria?**

**A6**

**We explain the E and H dominance theory in aeropic bacteria and the haitat pufferfish.**

Note also that the starting radial rays of the field E are not yet complete and that the tiny elements of the circular field H are in their first phase of formation perpendicular to E (H. $\perp$ .E). In the case of the early phase where the n and E densities are low, no complete radial or circular pattern is observed. But both radial (E-Field driven) and circular (H-Field driven) beams progress at the same time although radial beams are much faster.

This instantly leads us to an alternative hypothesis that nature itself equips every bacterial cell with one or more free electrons as a "walking" mechanism to be able to survive and search for food.

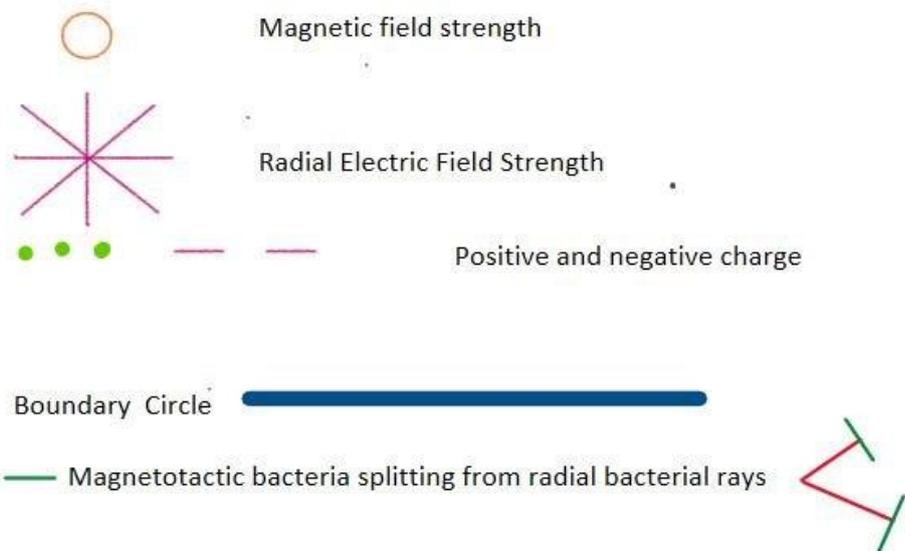
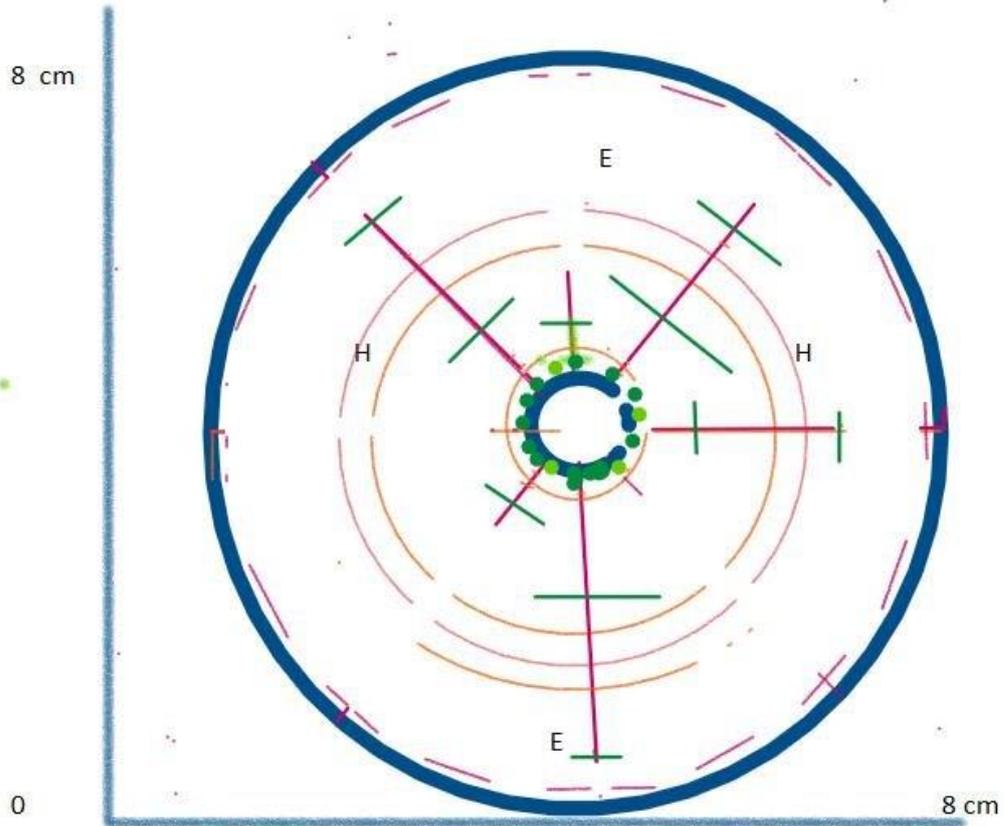
The bacterial cell carries a negative charge  $Q = N e$  on its surface, (where N is the number of free electrons and e is the electronic charge equal to  $-1.6 \times 10^{-19}$  Coulomb). However, we will not discuss in detail the origin or the mechanism of generation of

negative charges in different types of bacterial cells in order to focus on the mechanism of its transport movement.

For this, we propose the following hypotheses:

i-The so-called legs are actually negatively charged appendages that extend radially and act like strings or ropes pulling the bacterial cells in a direction anti-parallel to its own intrinsic E and at the same time they influence the bacteria rich in iron via magnetic force, i.e.in circular motion normal to E.

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**Fig.2. E and H constitute the macroscopic walking drive mechanism for magneto bacteria cell colony.FigF**



**7 days Growth of bacteria on a flat food surface (high quality Egyptian bread) maintained at 4 degrees Celsius with a pH of 7, normal air and humidity.**

### **III. Conclusion**

**The current article is a small step on a long road.**

**We propose that a more in-depth study of experimental microbiology and a theoretical study of mathematical physics**

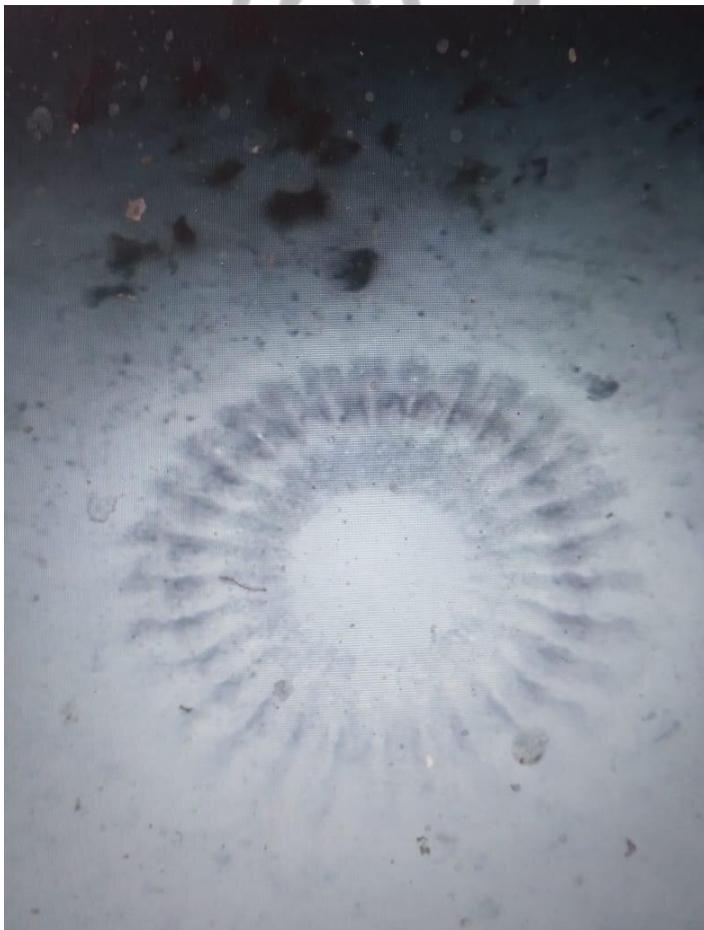
**is important to reveal more features of bacteria growth in 2D and 3D geometric space.**

***Fig. 3. Seven-day growth of magnetostatic bacteria on high-quality Egyptian bread at 4 degrees C.***

ii- The higher the number of free electrons in a particular bacterial species, the greater its negative charge on its surface. This may be a function of the number of evolutionary stages it has passed through. However, we will not discuss in detail the origin or the mechanism of generation of negative charges in different types of bacterial cells and therefore inhibits its ability to survive and adapt to food scarcity conditions over time in 2D and 3Dgeometric space.

iii-

**Figure 4 below show the habitat of puffer fish deep under the dark ocean water,**



**Figure 4. The habitat of puffer fish deep under the dark ocean water.**

**The amazing similarity between aerobic bacteria habitat in Fig 3 and pufferfish habitat in Fig 4 can be understood via E and H in 2D surface space shown in Fig 2.**

## **IV. Conclusion**

In this article we introduced and analysed 6 important and urgent questions:

1-Is it true that nature is intrinsically statistical and that a statistical system must necessarily be bounded?

2- What is the intelligent matrix?

3-What is negative diffusion?

4- How to master the theory of a nuclear power plant reactor and the standard size of the Hiroshima nuclear bomb, while ensuring that neither turns into the other?

5- What are the similarities between Markov chains and the Cairo techniques transition chains?

6- Is there a similarity between the pufferfish habitat and that of aerobic bacteria?

The detailed answers to the above questions via the statistical theory of Cairo techniques is presented and explained in the theory and applications.

The numerical results are surprisingly accurate.

***NB. The author uses his own double precision algorithm, such as that of references 27, 28, 29. No ready-to-use Python or MATLAB algorithms are needed.***

## **Aknowledgement**

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