

The solar, regenerative critical system (a day-month-year-century to infinite)

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MOTTO: “The mind there is in all beings/“permafrost”, but the each body is different/“dark energy”

HIPPOCRATES

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Abstract: *The solar-periodic system is a completely self-contained space, with no singularity or boundaries, which timelessly regenerates preserving its initial states (origins) and completely described by Euler’s complex theory of holomorphic (complex-smooth-recurrent) functions, ever discovered. This unified theory is the basis of eternal existence furnishing the building blocks of reality and the solution for long-standing problem of Cartesian dualism. It demonstrates precisely how mind generates relative/temporary matter in a metastable (phasing) equilibrium through the quantum dual isomorphism (e, p) of light, mutually regenerating matter. Physically it manifests as the quantum recurrence at the three levels/scales: quantum chemical elements (Mendeleev’s law, atomic frozen spiral), molecular thermistors (thermal molecular spiral) and astronomical gravitational rotating bodies (global/integrated solar system of planets and satellites). The periodical chemical elements are the first 94 known to occur naturally on Earth, of which 36 are primordial making up “the permafrost”. These are elements from the p-block (including hydrogen and helium) of the periodic table, where their atomic structure has completely filled subshells preserving initial states are daily and monthly (Krypton) regenerating (24 hours-one day) $\cong \frac{1 \text{ atomic mass } (P_u)}{g_0 \text{ atomic number } (Z)}$. They genuinely have a dual character (two allotropes/states), owing to the primal quantum contact $((e + e^2)^{1/4} \cong \pi^{1/2})$. The molecular structures and astronomical body configurations, self-contained them, are regenerating after a year and respectively century following a binary gravitational rule, $\left(\frac{g_0^2}{2}\right)^{\frac{1}{2}} = 7 (\log g_0 = 1)$, for critical mixtures, the so-called the relative peakedness or two soliton coherent distribution (phases). The solar regenerative system is a critical system in the sense that is “an autocatalytic thermomolecular reaction” regenerating its initial states only in strict conditions. In such a system the reaction products increase the rate of reaction and if the ratio of system surface to system volume is large, then the reaction products tend to escape at the boundaries of system. Contrary, if the surface to volume ratio is small then the rate of escape may be less than the rate of formation and the reaction rate may extinguish or re-ignite for a critical size where rate of production just equals the rate of removal. At such a critical size, given by Sobolev isoperimetric inequality $(4\pi A (\text{aria}) \leq P^2 (\text{perimeter}))$, the reaction is self-*

sustaining and is going on for so-long time the rate of regeneration does not exceed the rate of production. The bases of the Eulerian quantum dual isomorphism of light which explain close relationship between quantum automorphic wavy light and the solar timelessly regenerative system, in a photostationary (or frozen) equilibrium, are considered.

Key Words: quantum thermodynamics, periodic chemical elements, thermochemical wavy, Joule-Thomson expansion, global warming, astrophysics

1. THE REGENERATIVE QUANTUM UNIVERSE

The natural quantum universe is a completely self-contained multiple universe triggered off by the quantum light phenomenon timeless recurrent and self-sustained. It is a perpetuum cooperative phenomenon unifying all physical processes producing periodical order-disorder allotropic transformations where certain subsystems will combine to form units which hold together in spite of the disrupting influence of heat release (warming). The light is a shouldering flameless combustion phenomenon, where the well-defined light velocity ($c_s \equiv g_0^{g_0} \text{ m/s}, \log g_0 = 1$) along with its quantum isoperimetric fluctuation (e, π) are the origins of the beginning of the quantum universe or big bang, lost in the time infinity (or timeless), but it is physically limited and easily recognized through their early and lately states (Gaussian quantum collisions sketched in the sequel, Fig. 1). There are two-topological recurrent quantum forms, preserving their initial states: the quantum dynamics given by Gauss-Laplace collisions producing light and matter (Mendeleev’s law) reciprocally self-sustaining, and the quantum kinetics of Euler dual automorphism (similar allotropic transformations), little understood. The more comprehensible holistic approach of light as cooperative multiple-phenomenon can be summarized by

$$C_s \equiv \frac{1 k_B}{2 h_P} = 10^{10} \text{ m/s} , \quad \text{the self-ignition velocity of light,}$$

($k_B = 1.381 \times 10^{-23} \text{ JK}^{-1}$, Boltzmann constant, (1)
 $k_P = 2/3 \times 10^{-23} \text{ Js}$, Plank’s constant)

$$C_{ch} = \alpha_H g_0 C_s \equiv \frac{g_0 M_\odot}{m_{MOON}} = e \times 10^8 \text{ m/s} , \quad \text{the thermochemical reaction velocity (opposed to } C_s),$$

($\alpha_H = eK/1000K = e \times 10^{-3}$, the vacuum fine structure constant of H_2 , (2)
 $M_\odot = 2 \times 10^{30} \text{ kg}$, the mass of Sun,
 $m_{Moon} = e^2 \times 10^{22}$, the mass of Moon)

$$C_s^{\frac{1}{2}} \equiv F = \underbrace{q_e}_{\text{electron flux}} \times \underbrace{N_A}_{\text{molecule flux}} \Leftrightarrow \underbrace{(p_c T_c)}_{\text{thermochemical electric charge}}$$

($F \cong 10^5 \text{ C} \cdot \text{mol}^{-1}$, the Faraday constant, (3)
 $q_e = -1.6 \times 10^{-19}$, the electron charge,
 $N_A \equiv 2\pi C_s^{\ln g_0} = \frac{m_E}{g_0} = 6 \times 10^{23}$ molecules/mol,
the Avogadro constant,
 $p_c = 10^2 \text{ bar}$ ($C_s^{1/2} \equiv 10^5 \text{ Pa} = 1 \text{ bar}$), the critical pressure,
 $T_c = 10^3 \text{ K}$, the critical temperature for molecular structures,
 $T = (273.16 + T^0 C)^0 \text{ K}$, the thermal redshift (splitting temperature))

$$C_s^{1/2} \equiv F = \frac{1}{Z} \frac{2.303 RT}{E^0 - E_e} \log \frac{|\text{reduced}|}{|\text{oxidised}|}$$

intermittent galvanic current
(cyclical ON-OFF light or SUNRISE-SUNSET process)

the Nernst equation for an electrode,
 $(R \equiv (e\pi) = k_B \frac{m_E}{g_E} = 8.3145 \text{ JK}^{-1} \cdot \text{mol}^{-1}$, the universal gas constant,
 $2.303 \equiv \ln g_0$ ($g_0 = 10 \text{ m/s}$ the gravity unit,
 Z , the number of moles of electrons in the reaction, (4)
 $\frac{1}{Z} = \frac{F}{RT \ln g_0}$, the Nernstian slope,
 pH , the potential of hydrogen,
 $\Delta E = E^0 - E_e$, the electrochemical or galvanic potential)

$$C_s^2 \equiv \underbrace{M_{\odot}^{\frac{2}{3}} \rightleftharpoons N_A^{\frac{7}{8}}}_{\text{regenerative energy (cyclical mass flux or birth-death process)}}$$

the regenerative matter (after Boulvin *TS* – diagram),
 $(\mu_{\pi} = \frac{e^3}{\pi^3} = \frac{2}{3}$, the Joule-Thomson cooling expansion, (5)
 $\frac{e}{\pi} = \frac{7}{8}$, the locked quantum expansion)

The Eulerian phasing automorphism is the base of the regenerative solar system in the photo stationary state $C_{ch} = C_{lim} = e \times 10^8 \text{ m/s}$, given by [1-3]

$$(e\pi)^{2/3} \rightleftharpoons \frac{\pi^3}{e^2} \cong 4, \quad \text{the quantum expansion,} \quad (6)$$

$$(g_0 e^2)^{1/3} \rightleftharpoons (g_0^2 e)^{1/4}, \quad \text{the quantum twist/torsion,} \quad (7)$$

$$\left(\frac{e}{\pi}\right)^3 = \frac{2}{3}, \left(\frac{e}{\pi}\right)^7 = \frac{1}{3} \quad \text{the locked coherent phases or restricted reversibility,} \quad (8)$$

Equations (1-5) illustrate the natural intrinsic process of regenerative solar system, a kind of the phenological unified theory of light, while the Eulerian phasing automorphism, Eqs (6-8), is the timeless quantum recurrence process, preserving initial states (or phases, $\left(\frac{e}{\pi}\right)^{\zeta}$ with $\zeta = 1 - 7$). In fact, Eqs (6-8) define a thermogravitational wave function for a quantum torsion/friction contact characterizing molecular structures in an adiabatic thermodynamic system. Both Eulerian automorphism and Gaussian distributions are topological complementary regenerative forms for molecular (warm) and atomic (cold) structures akin to the regenerative solar system. The Gaussian distribution describes a quantum collision contact (Fig. 1) given by

$$\frac{1}{\pi^2} \int_{-\pi}^{\pi} e^{-x^2} dx \rightleftharpoons \frac{\ln g_0}{2\pi^2} \ln g_0^{\chi^2} \left[\begin{matrix} 1 \\ 0 \end{matrix} \right], \quad \text{the Gaussian collision on a bounded unit disc } (\pi^2), \quad (9)$$

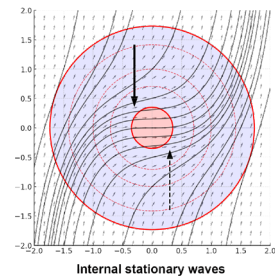
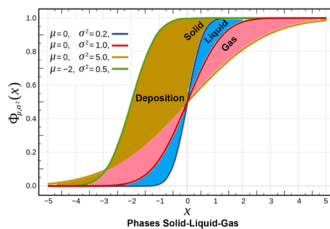
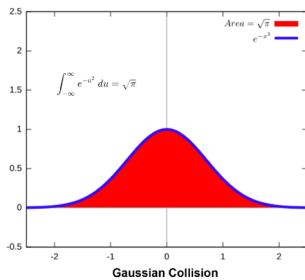


Fig. 1 The Gaussian collision-quantum wavy light model

where for the Sobolev isoperimetric critical size, $r_c = \sqrt{\pi}$, the collisions are timelessly regenerating, preserving two extremity states (or allotropic phases) and a gravitational deposition/shutterstock or compacting which slowly restoring as a Gaussian blurring phase Equation (9) defines a quantum-gravitational (short wave length) wave function for a quantum collision contact (no-friction) characterizing atomic structures of a pulsating nature (isotopes and allotropic states with electron jump/mutation), akin to wavy light. The regenerative atomic and molecular structures fill together the carbon hydrosphere and atmosphere constituting the whole regenerative solar system where the Earth is the critical planet with $m_{EARTH} = 6 \times 10^{24} Kg$, a molecular bulky density, $\rho_{EARTH} = \frac{6 \times 10^{24}}{N_A} = 10 kg/mol \equiv g_0$ and its satellite moon, $\frac{m_E}{m_{MOON}} \cong 100^0 K$, permafrost providing a photo metastable/phasing equilibrium of the regenerative process for the whole system, including beings. The quantum recurrence/regeneration process of initial states (e, π) with their temporary conservation, called the gravitational deposition (or compacting) is a universal process, which is synonymously expressed mathematically as strange attractors (SA), two soliton coherent structure (SCS), and physically as cyclical relative peakedness distribution (kurtosis), buckling torsional/twist process (B.T.), birth-and-death process (B.D.), Poincaré three body problem (P.P.), Boulvin reciprocating entropic process (BTS).

Herein, this regenerative process for the solar, regenerative, critical, self-contained system is considered. Historically, three major conceptions of the universe have emerged, each corresponding, the some extent, to the reality of our world:

- 1) The Newton Conception (Mechanics) – this model describes an absolute space and time framework, where motion is expressed through simple equations, $s(t)$ as a function of time. They incorporate an universal constant, given by $\mu_N = \mu_{JT} c_s$, where μ_{JT} represents the Joule-Thomson expansion cooling effect;
- 2) The Einsteinian Conception – this perspective introduces curved space-time of gravity as a dynamic entity, characterized by its continuous expansion (spatial dilatation), leading to the well-known Quantum mechanics theory. This framework is fundamentally linked to Einstein’s famous energy-mass equivalence formula $E = mc^2$;
- 3) The Holistic Conception – this model envisions a regenerative or recurrent universe, which is completely self-contained and timelessly extends. Its evolution is governed by critical thermodynamic conditions, based on the automorphism of wavy light and the similarity of allotropic states. The system follow a closed formulation:

$$c_s^2 = M_{\odot}^{2/3} \rightleftharpoons N_A^{7/8}$$

where $\frac{2}{3} = \frac{e^3}{\pi^3} = \mu_{JT}$; $\frac{7}{8} = \frac{e}{\pi}$, the restricted quantum expansion.

A critical regenerative universe, encompassing all phases of reality-including human existence, has long and continuously lasted. This model is founded on the dual quantum automorphism of wavy light, exhibiting isoperimetric fluctuations similar to a flameless smouldering combustion process. Such a process has the capacity to preserve timeless regenerative thermomolecular structures, provided it remains under controlled conditions. The smouldering combustion process occurs at all scales of matter (atomic, molecular and astronomical bodies), manifesting as back-oriented light (or the “fire wake” of light). The matter bounded by gravity serves as an essential stabilizing factor for light, facilitating the morphosynthesis of matter as stable, compact, timelessly regenerating structures akin to a “perpetuum mobile” system. This regenerative process is sustained only if the velocity

involving chemical reactions does not exceed the critical re-ignition velocity of light, given by $c_{ch} \leq c_{lim} \cong 10^8$ m/s (see Eq. 2).

The back-oriented light universe, operates in a dynamical equilibrium governed by wavy light. Within this framework, gravitational mass, gravitized matter or compacted matter, is essential for the existence of light and its recurrence, conversely saying, in the absence of light one encounters a state of perpetual frost or black hole.

Furthermore, the notion of antimatter remains predominantly theoretical, emerging either as a mathematical construct introduced by Dirac or as a potential misinterpretation of some physical results as suggested by Higgs. This challenges its classification as a tangible physical entity. Since the time of Einstein, the positivist approach in physics – firmly anchored in empirical observation and experimental validation – has gradually evolved toward a more speculative paradigm reminiscent of science fiction. This shift has incorporated concepts such as antimatter, dark matter and energy, as strange phenomena such as black holes and worm holes. These function as folkloric or heuristic expressions rather than being grounded in physical reality.

2. THE GENUINE QUANTUM NATURE OF MATTER

Through Mendeleev's formulation [4] of the periodic law as a dependence of chemical properties on atomic mass, recognized as a fundamental discovery of atomic structured matter in the late 19th century, it was emerged the Bohr-Planck-Schrödinger-Einstein pioneering work [5-9] associated with the quantum mechanics in the early 20th century, the most achieves of current world thinking. Both ideas have illuminated on the atomic internal structure of matter predicted two half thousands ago by Democrit [10], its thinking being impregnated with deep humanism, rationalism and materialism. However, the previous quantum theory is a unfinished theory, deeply embedded in physics with a lot of empirical phenological constants, each characterizing a certain phenomenon. Thus, the previous quantum theory seems a kind of the co-operative theory at which have contributed the most famous scientists at that time, to patch the local multi scale structures from the atomic scale (m_{1H}^1 , the atomic mass of neutral hydrogen) to the astronomic scale (M_{\odot} , the solar mass). Despite the efforts of many brilliant people over the more than half century, the problem was solved, up to 10^{18} GeV of Planck energy scale, the rest thermogravitational scale ($m_{pu} = 244$ kJ/kg, the atomic mass of plutonium) remaining "desert". The present state of affairs has hidden the true quantum nature of the quantum mechanics as an unified theory of physics (GUT). The present holistic conception is based on the automorphic quantum wavy light, which is able to unify the electrodynamic and thermodynamic through a cyclical regeneration process of multiscale structured matter. This process timelessly generates galvanic intermittent current, including also human smouldering flamless/internal combustion reactions and containing all constants met in classical phenological physics. This is the quantum physics of light, i.e. an unified phasing theory (GUT), describing the morphosynthesis of regenerative matter as a success of photostationary states/phases in frozen metastable equilibrium involved both in electrodynamic and thermodynamic phenomena occurring in nature (Eqs. 1-5). The quantum form (or wave function) of automorphic wavy light (Eqs. 6-9) is the base of the solar regenerative critical (or restrained) system. As a rule the generic term "critical" is synonymous with restrained, restrictive or frozen for the quantum and gravitational recurrence of initial states, without their collapsing.

The quantum mechanics (atomic structures with splitting/elementary particles) is the Plank-Bohr-Einstein-Schrödinger pioneering quantum mechanics (in early 20th century)

emerged from the Mendeleev’s periodic law (1869- the dependence of chemical elements on atomic mass [4]) which was a fundamental discovery of atomic structured matter of the 20th century.

Based on the Maxwell’s electromagnetic theory (1891) [9] and Bohr’s atomic model (1913) akin to the solar system (the heliocentric system), with a solar nucleus and 8 planets orbiting around its), the quantum theory has **the main drawback as the lack of thermomolecular long standing interactions of a gravitational nature.**

This is a result of the unfinished paradigm using:

- The mispostulated of constant light ($c = 3 \times 10^8$ m/s);
- The misdefinition of gravity as a Weyl tensor (Δg_{ab} with $\Lambda = 10^{-55} \text{ cm}^{-2}$, the cosmological empirical constant and $\nabla g = 0$) in the Einstein’s field tensorial equation ($R_{ab} - \frac{1}{2}Rg_{ab} + \Delta g_{ab} = -8\pi GT_{ab}$), without any physical relevance;
- The unfinished interpretation of the periodic table as frozen chemical elements, without their recurrence or regeneration limited by a gravity (period $P = 7$) monitoring the chemical reaction of light, i.e. the thermos-chemical (gravitational) waves to do not escape at the boundaries of the system.

Briefly, the Planck’s law (black body):

$E = h\nu, h = 2/3 \times 10^{-33}$ Jules \cdot s, ν – radiation frequency, which determines a ionization energy of chemical elements and $max E_{He} = 24.6 \text{ eV}$ (the ionization energy of helium), $1 \text{ eV} = 0.16 \cdot 10^{-20}$ Joules = $\frac{g_0^2}{2\pi c_s^2}$, shows little on their recurrence process, reduced only to electronic orbital motions (emitted photons), but a new interpretation as the mass of Earth: $m_E = C_S^{E_{He}} \cdot g_0^{-1} \equiv 6 \times 10^{24} \text{ kg}$. is given.

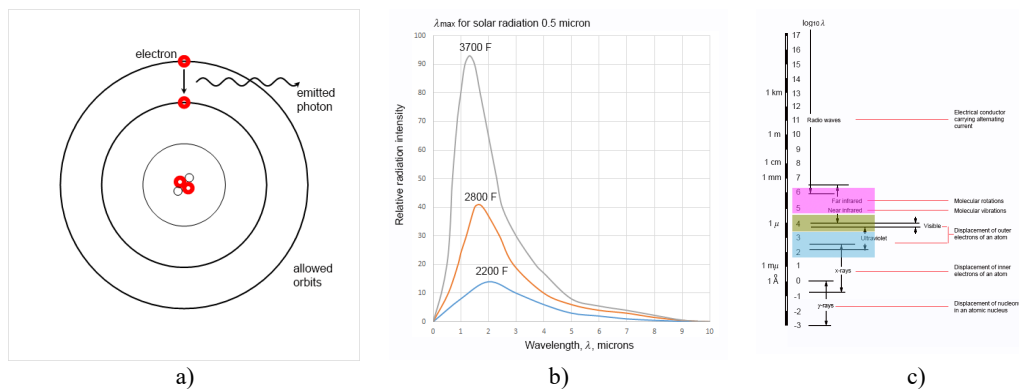


Fig. 2 Bohr model: a) electron jumps between given orbits; b) Planck’s law for thermal radiation (Wien’s displacement law); c) the spectrum of electromagnetic radiation

3. THE MODEL QUANTUM THERMODYNAMICS (MOLECULAR STRUCTURES WITH NON-SPLITTING PARTICLES/CHEMICAL ELEMENTS)

This approach follows to remove the previous shortcomings and to complete the morphosynthesis of matter, regenerating organic matter only in critical conditions (or gravitational conditions)

Thus, a more realistic and comprehensive model is devised.

3.1 The postulate of quantum wavy light consist from

1) The postulate of wavy light:

$$c_s \equiv g_0^{g_0} = 10 \frac{m}{s}, (e + e^2 \cong \pi^2 = g_0, \log g_0 = 1)$$

2) The axiom of topological multi-form equivalence (the critical Sobolev isoperimetric inequality $4\pi A(\text{arie}) \leq P^2(\text{perimeter})$ [10] for topological shapes (complex, smooth and recurrent called compact, closed or self-contained) disc, Gaussian bell, pseudosphere, Riemann sphere.

3) The principle of invariant (or invariable) energy: all energy forms as a product of Mendeleev's periodic law are equivalent or interchangeable, expressed by conversion factors

- $\varepsilon \equiv g_0^2 / 2\pi c_s^2 = 1.6 \times 10^{-19}$ eV/Joule, the electrochemical equivalent of Joule
- $J \equiv \frac{\pi^3}{e^2} = 4.196$ Joule/cal, the mechanical equivalent of calorie
- $J^{-1} \equiv \frac{e^2}{\pi^3} = 0.2383$ cal/Joule, the thermal equivalent of Joule, $1 \text{ Btu} \equiv (e^4 - g_0) = 44.6$ Joule/K, the quantum nature of relations among derived units (enthalpy, internal entropy and mechanics).

4) The seven phase law/rule of allotropic transformations for regenerative matter.

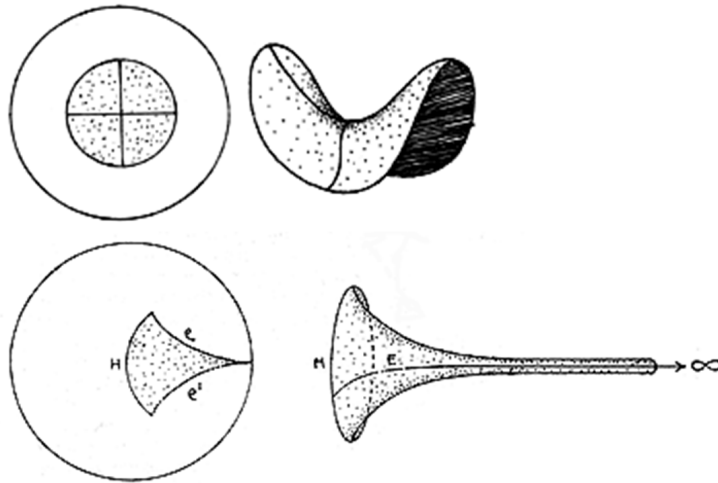


Fig. 3 The isoperimetric topological chapes

The natural self-sustained and self-ignition wavy light ($c_s = 10$ m/s) is a timeless “autocatalytic reaction” occurring in a system with critical sizes for which the rate of production just equals the rate of removal, $M_{\odot} = 2 \times 10^{30}$ kg, the solar mass (“SUN”). The light produces alternatively light and matter in a photostationary state:

$C_{ch} \leq C_{lim} \cong 10^8 \text{ m/s} (C_{lim} = \ln g_0 C_s^{g_0-2}, \log g_0 = 1, C_s = g_0^{g_0})$, the self-ignition velocity (the wavy light postulate).

It is a flameless smouldering combustion process occurring both inorganic and organic matter.

Such a critical regenerative universe conception (completely self-contained system) encompassing all phases of reality, including human long existence, is proposed. It is founded

on the dual quantum automorphism of wavy light, exhibiting isoperimetric fluctuations (a flameless smouldering combustion).

The wave function of wavy quantum light is given by the well-known relationship between the natural (Neper) and decimal/gravitational logarithms

$$\log x = \frac{e}{2\pi} \ln x, x \in [1, \infty), \quad \text{the wave function of way quantum light,} \quad (10)$$

$e^{2k\pi i} - 1 = 0, (k = 1, 2)$, the Euler’s complete formula on the unit circle where $C_s \equiv g_0^{g_0} = 10^{10} \text{ m/s} (\log g_0 = 1)$, is the self-ignition light velocity, $M \equiv \frac{e}{2\pi} = 0.433, \frac{1}{M} = \ln g_0 = 2.3$, the logarithm module and its inverse (restrict reversibility).

Physically, the (M, M^{-1}) represents the torsion/twist (τ) and curvature (χ) of quantum wavy light operating in a reciprocating mechanism akin to a piston moving back (M) and forth ($1/M$) in a cylinder (herein the solar self-contained system), with the energy transport non by electromagnetic waves, but thermomolecular chemical waves (tidal like waves).

The velocity=kinetic energy dualism of wavy quantum light

$$\widetilde{C}_s = \tau C_s^\chi, \text{ the wavy quantum light, } \left(\frac{e}{\pi} + \frac{\pi}{e}\right)^k = 2, k = 1 - 4$$

is the multiple solutions of the natural/intrinsic equations of mechanics

$$\underbrace{\chi = \chi(s)}_{\text{curvature}} \geq 0, \quad \underbrace{\tau = \tau(s)}_{\text{torsion/twist}} \quad \text{via the Frenet-Serret formula}$$

The wavy curved-twisted light in a critical size system, reciprocally occurs both regenerative natural quanta (e, π) and chemical elements (in a restricted number $Z = \pi^4 = g_0^2 = 100$) by timelessly colliding process (Gaussian frictionless collisions, in photostationary state as a “permanent frost” (the rate of production just equals to removal or the frozen/metastable equilibrium)

$$\frac{1}{\pi^2} \int_{-\pi}^{\pi} e^{-x^2} dx \rightleftharpoons \frac{\ln g_0}{2\pi^2} \ln g_0^{x^2} \parallel \frac{1}{0}, \text{ the Gaussian collision on a bounded unit disc } (r_c)$$

where $r_c = \sqrt{\pi}$ is the Sobolev isoperimetric critical size, preserving two extremity states (or allotropic phases) and a gravitational deposition/shullstock which slowly is restoring as blurring phases (Fig. 1)

3.2 The Mendeleev’s periodic law

The impact energy of the 94 naturally occurring elements, H (hydrogen) – Pu (plutonium), is accumulated/stored as latent heat or enthalpy (h) and slowly released as a local internal energy (u). This is the Mendeleev’s periodic law of chemical elements where the atomic number Z is a quantum number and the atomic weight represents the enthalpy (k Joules/kg, the heat capacity at constant pressure) of the chemical element. In contrast with the atomic Bohr-Schrödinger model (the energy quantization of each electron configuration of chemical elements), the wavy light-Gaussian collision model gives a more realistic description using the (p, T) thermodynamical field produced by light:

$$C_s^{1/2} = 10^5 \text{ Pa } (1 \text{ bar}) \text{ and } p = 100 \text{ MPa}, T = 10^3 \text{ } ^\circ\text{C} \text{ (fixed by the convention)}$$

Thus, the unique atomic number is a quantum number embodying the phases of elements

$$Z_q = \underbrace{\sum_{k=1}^2 k \frac{\ln g_0}{g_0} + \log 2}_{\substack{\text{deposition/schulterstock} \\ \text{(solid-gas-solid)}}} \cong \underbrace{4 \frac{\ln g_0}{g_0}}_{\substack{\text{no-deposition} \\ \text{(solid-liquid} \\ \text{-gas-solid)}}} \quad \text{the seven phase rule of a critical triple point (TPorT3, the coexistence of three different phases in equilibrium state)} \quad (11)$$

According to the rule of phases, the chemical elements from the first 4 periods ($P = 1 - 4$) are the fastly regenerative chemical elements, preserving the initial properties (the so-called “permafrost” or quantum loop), following allotropic modifications. The elements from the $P = 5 - 6$ periods constitute the gravitational deposition, the so-called the “dark energy” (heat), slowly regenerated, which accumulates heat until the constant enthalpy $H_{Pu} = 244 \text{ kJoules/kg}$ the last chemical element (Pu – plutonium), naturally occurring on Earth.

Of the regenerative elements $P(-4)$, four there (C – carbon, P – phosphorous and As – arsenium) are primordial constituting crystalized structures with two allotropes (atomic and molecular state), the so-called “permafrost” (crystal state), (Fig. 4).

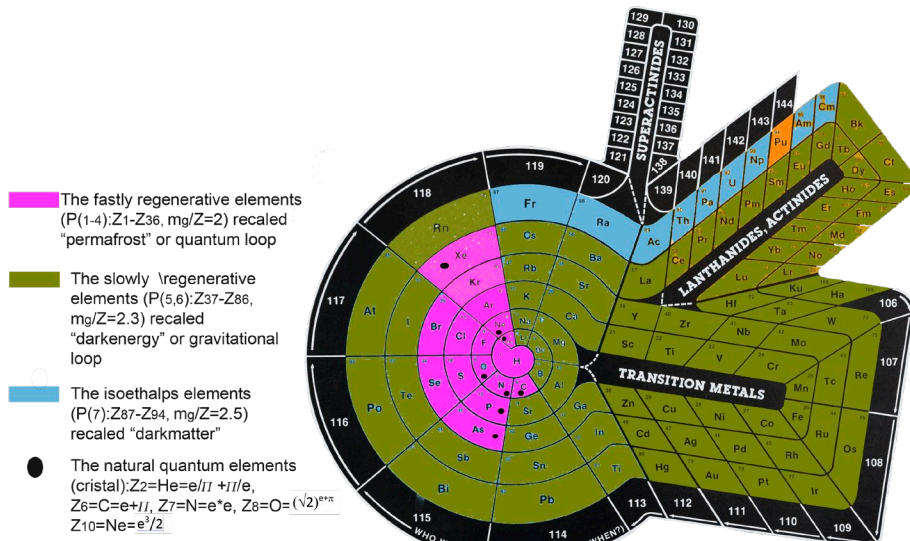
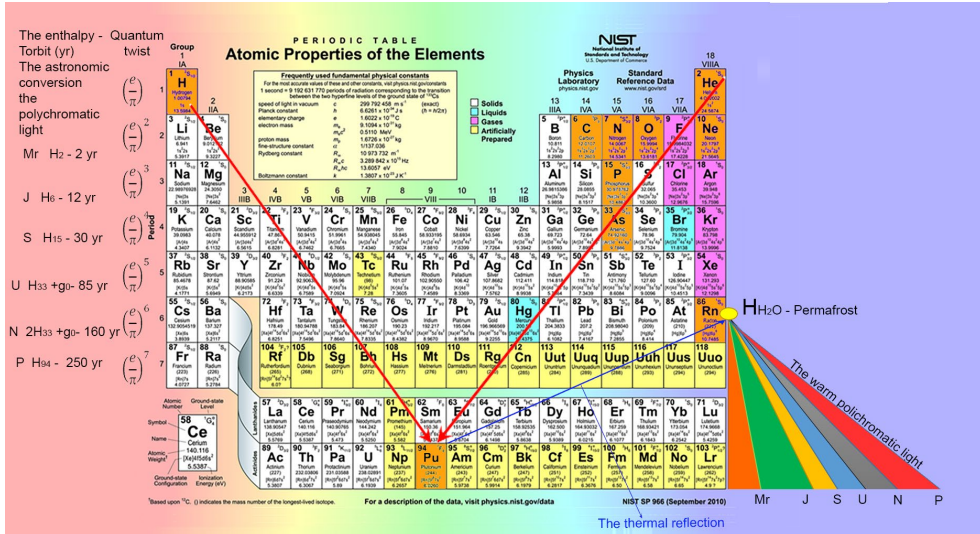


Fig. 4 The Mendeleev’s periodic law (thermodynamic interpretation): a) the molecular morphosynthesis of chemical elements, naturally occurred by light energy (c_s^2) in a year ($Z_{94}(Pu)$): the mass-energy equivalence $H_{Pu}(kJoules/kg) \approx g_0He(eV) \approx 1kg \leftrightarrow 2\pi \times 10^{16}Joules$; b) the prestwisted chemical elements into a year and relaxation beyond a century ($Z_{86}(Rn) - Z_{100}(Fm)$)

The first two elements (H – hydrogen and He – helium) with the inversion rule of phases ($g - s - g$ and $g - s - lq - g$), locks the cooling expansion from the frost, occurring the rise in temperature of gases.

The regenerative crystals release the latent heat (smouldering chemical reaction) of the frost which triggers thermomolecular reactions at the critical triple points particularly for the polyatomic molecules (acids).

The chemical reactions regenerate and sustain a thermochemical waves system occurred by molecular structures at the different rate in photostationary states (frozen or metastable equilibrium).

The flow of critical molecular mixtures (mono – di – triple atomic molecules) at triple point temperature, T_3 transports the colliding heat through the phenomena of retrograde vaporization and retrograde condensation occurring thermochemical waves of the tidal wave type [1].

The 18 groups represent the quantum expansion $(\sqrt{2})^8$ (or atomic oxygen) locked by $\frac{1}{2}(\sqrt{2})^{18} = 256$ (the enthalpy of Fm (fermium), the 100th synthetized chemical element).

Of the 94 elements naturally occurring on Earth, $Z_q = 36$ (Kr – krypton) are regenerative elements preserving the initial identity, vital to conserve the solar system in photostationary regenerative state (PRS), including human beings. The Earth is “the unique material dual automorphism occurred by wavy light”. The global regeneration period of chemical elements can be as the orbital (sideral/equatorial, to spinorial (synodic/polar) period ratio or the spin-orbit rotation of Earth.

$$g_0 \left(2^{\frac{G=2}{2}} \right)_p \rightleftharpoons 365.7 \equiv \frac{T_{sideral}}{T_{synodic}}, \quad \text{one terrestrial year,} \quad (12)$$

with

$$\mu_{JT} \cdot \frac{T_{sid}}{T_{syn}} = 243 \text{ kJ/kg, the isoentals (the locked recurrency of chemical elements).}$$

3.3 The quantum thermodynamics and the similarity of allotropic transformations

The quantum thermodynamics, in contrast with the classical thermodynamics, firmly based on experiment, is the phenomenological description of heat flow (or thermal transport) accumulated in the 94 natural chemical elements by Gaussian frictionless impact of wavy light, based on the rule of phases.

The constant plutonian enthalpy (h), $H_{Pu} = 244 \text{ kJoules/kg}$ ($1 \text{ Btu} = 10^3 \text{ Joules}$, the British thermal unit of quantum natural: $1 \text{ Btu} = (e^4 - g_0) = 44.6 \text{ Joules/K}$) is the specific heat capacity (heat for 1 kg) at constant pressure,

$$C_p = \left(\frac{\partial h}{\partial T} \right)_p, \text{ given at critical allotropic triple points}$$

$$p_3 = p_c \equiv C_s^{\frac{1}{2}} = 10^5 \text{ Pa} = 1 \text{ bar}, \left(g_{av} = \frac{g_0}{2} = 5 \right), \text{ fixed by the convention,}$$

where

$$a = C_s^{1/4} = 316.2 \text{ m/s, the acoustic velocity at } T = 0^0C,$$

$$\mu_c \equiv \frac{a}{10^3 C} = 0.32, \text{ the cooling expansion beyond the light polarization and}$$

$\mu_w \equiv \frac{e^3}{\pi^3}$, the locked cooling effect, beyond the warming follows as a result of the wavy light postulate; it is the Joule-Thompson coefficient experimentally found, μ_{JT} [11], for the cooling expansion occurred by light diffraction/polarization.

The constant enthalpy is transported by thermal conductivity in fluid mixtures involving critical allotropic transformations of retrograde vaporization followed by its retrograde condensation. The constant enthalpy (h) **occurring the internal energy (u) of critical fluid mixtures depends only on their temperature associated with a theorem of the similarity between allotropic transformations.** This is the general formulation of Joule's second law viewed as a configuration of seven photostationary molecular structures/phases.

This is the "permafrost" formed by He, C, P, As (monoatomic molecules), N_2O_5 (dinitrogen pentoxide), N_2O_4 (dinitrogen tetroxide) and N_2O_3 (dinitrogen trioxide) in crystallized state.

The configuration timelessly recurring with a frequency/rate of one day – month – year – century (the locked cycle), constitutes the quantum morphosynthesis of the regenerative solar system involving self-contained multi-scales (chemical elements, molecules, bodies).

The (h , u , s) entities are the state thermodynamical functions associated with the morphosynthesis of regenerative molecular structures submitted to allotropic transformations in critical fluid mixtures at equilibrium triple points (T_3) preserving a heat amount (or enthalpy h).

The physical mechanism of a fluid material during the adiabatic expansion by wavy light is the change in internal energy of molecular motion or the conversion between the potential (enthalpy) and kinetic internal energy (u) with a limited heat release by viscous/real molecular motion.

The temperature is the measure of thermal kinetic energy and the entropy (s) measures its lost (by warming) as the recurrence process goes on. The isoentals-internal energy shift is the true redshift described by Kelvin-Celsius change of the temperature scale.

The natural fundamental thermodynamical principle gives balance between variation of internal energy (du), heat release (dQ) and the work done in the amount of fluid (dW) as

$$du = dQ - dW \quad \text{the first principle of thermodynamics.} \quad (13)$$

The second principle is relating to the impossibility of complete conversion of heat into mechanical energy or a cyclical process is possible if and only if exists a heat transfer from a colder body to a warmer body. It is associated with an entropy function $ds = \frac{dQ}{T}$, $s_2 - s_1 = \int_1^2 \frac{dQ}{T}$ along any reversible path (or cycle), connecting the two equilibrium states/phases.

The third principle or Zeroth law of thermodynamics is relating to a system undergoing a reversible isothermal without heat transfer, its temperature defining absolute zero.

A consequence of zeroth principle is that two bodies which are in thermodynamic equilibrium with a third across a diathermal wall, they are in equilibrium with each other. The zeroth law of thermodynamics explicates the photostationary state of Earth – Moon – Mars astronomical bodies.

Also, according to this principle the regeneration/recurrence process of chemical elements (no heat transfer at zero absolute) is possible.

Of the 94 natural chemical elements, accumulating an enthalpy $H_{Pu} = 244 \text{ kJ/kg} \leftrightarrow H_{H_2O}$ as gravitational deposit viewed solar gravity, $G_{\odot} = e \cdot g_0^2 \text{ m/s}^2$, the 36 elements travel a cyclical process returning in initial state, and 3 elements with atomic weight/ $g_0 > 1$: C (carbon), P (phosphor), As (arsenic) are monoatomic molecules with two allotropic states: stable crystals (the so-called "permafrost") fastly regenerating, Fig. 4b. At high pressure and low temperature these occur the autocatalytic reactions composing the thermomolecular structures of regenerative solar system.

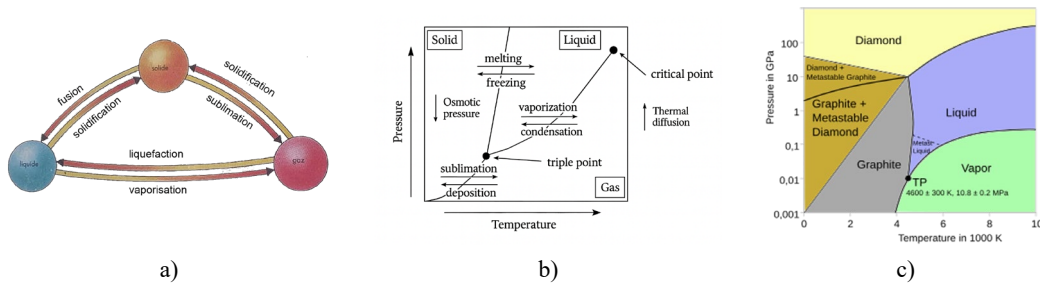


Fig. 5 The similarity of allotropic transformation elliptic navel (T_3, TP) in photostationary equilibrium: a) allotropic transformations (or phases); b) the nanoparticles (atom-molecule mixtures) and thermochemical waves - water ($TP - T_c$); c) carbon ($TP - p_c$)

The endothermal chemical reactions, at high pressures and low temperatures, with isoenthalp are based on NO_x (shorthand for nitric oxides), and the exothermal chemical reactions, at low pressures and high temperature are based on CH_x (for hydrocarbon).

In the case of NO_x critical mixtures, the system follows a process by which it comes back at the initial state (a cyclical process) and for an isoenthalp adiabatic flow there is

$$u_2 - u_1 = 0 \text{ and } W = Q_{warm} + Q_{co} \quad , \text{ the reversed Rankine cycle} \quad (14a)$$

where the working fluid (“refrigerant”) must be cooled at constant pressure fixed at the triple point (TP) by the convention, (the red shift of constant enthalpy).

The adiabatic constant-enthalpy (isoenthalp Joule-Thompson) process on the (p, T) diagram of a critical fluid $C_p = \left(\frac{\partial h}{\partial T}\right)_p$, is called the cooling expansion μ_{JT} , of a molecular nature.

The expansion of NO_x isoenthalps flow (or the Joule-Thompson throttling process) [11] is a standard isoenthalps flow for the entropy function (s) of a stability for cyclical processes.

The exothermal chemical reactions (CH_x) are $du \neq 0$ and isoenthalps non adiabatic process (the restricted reversibility: $\frac{H_{Rn}}{H_{Pu}} = \frac{222}{244} = 0.91$) described by (the first principle)

$$\underbrace{dU = dQ - dW}_{\text{the differential form}} \quad \text{or} \quad \underbrace{u_2 - u_1 = Q - W}_{\text{the finite form}} \quad (14b)$$

where writes

$$u_2 - u_1 = \dot{Q}_{in} - \dot{Q}_{out} + \underbrace{W_{pump}}_{\text{the reversed Rankine cycle}}, \text{ for } s < 5$$

$$u_2 - u_1 = \dot{Q}_{in} - \dot{Q}_{out} + \underbrace{W_{Turbine}}_{\text{the direct Rankine cycle}}, \text{ for } s \geq 5$$

The last regime is warming regime.

4. THE SOLAR REGENERATIVE SYSTEM

It is a self-contained quantum system which timelessly regenerate at each century, following the Mendeleev’s periodic law of chemical elements, naturally occurring in Earth: a day, the first 7 quantum elements, a month, the fast regenerative elements ($P = (1 - 4), Z_1 - Z_{36}, \frac{m_a}{Z} = 2$) the so-called “permafrost” or quantum loop, and a year, the last of slowly

regenerative elements (or “dark energy”) and isoenthalps elements (or “dark matter”), Fig. 4b. In the astronomic far field, the gravitational field of Earth manifests, at distance, through the regenerative periods of astronomical objects: Earth, self-contained, Mercury and Venus, and Moon, reshaping period ($H_{As} \leftrightarrow$ (equivalent)75 yr), Mars ($\frac{1}{2}H_{He} \leftrightarrow T_{orb.sid} = 2 \text{ yr}$), Jupiter ($H_C \leftrightarrow T_{orb.sid} = 12 \text{ yr}$), Saturn ($H_P \leftrightarrow T_{orb.sid} = 30 \text{ yr}$), Uranus ($H_{As} + g_0 \leftrightarrow T_{orb.sid} = 85 \text{ yr}$), Neptun ($2H_{As} + g_0 \leftrightarrow T_{orb.sid} = 160 \text{ yr}$), Pluto ($g_0E_i, H_C \leftrightarrow T_{orb.sid} = 250 \text{ yr}$), Fig. 4a, conserving the “permafrost” (crystal state).

In fact, the solar regenerative system is nothing else than the invisible long-time evolution of a binary self-contained system, Earth-Moon, i.e. a two soliton coherent evolving structure (SCES), where Mars ($m_{Mr} = N_A \text{ kg}, g_{Mr} = 3.72 \text{ m/s}^2$) and Jupiter ($m_j = 2 \times 10^{27} \text{ kg}, g_j = 24.79 \text{ m/s}^2 \leftrightarrow E_i, He$ – the ionization energy of He) are the extremely phases, beyond following by decay and re-ignition.

The zoom at the terrestrial scale, of mixed carbon (C) – nitric oxide (NO) crystals floating ($p_0 \equiv c_s^{1/2} = 1 \text{ atm (bar)}$) in boiling water ($T_b \leq 44^\circ\text{C}, CO_2 \rightleftharpoons N_2O, \mu_{JT} = F^{1/2}$), the **global warming chemical effect** is described by the similarity of allotropic molecular transformations (T_3, TP) in photostationary equilibrium called the hydraulic analogy of wavy light, Fig. 6.

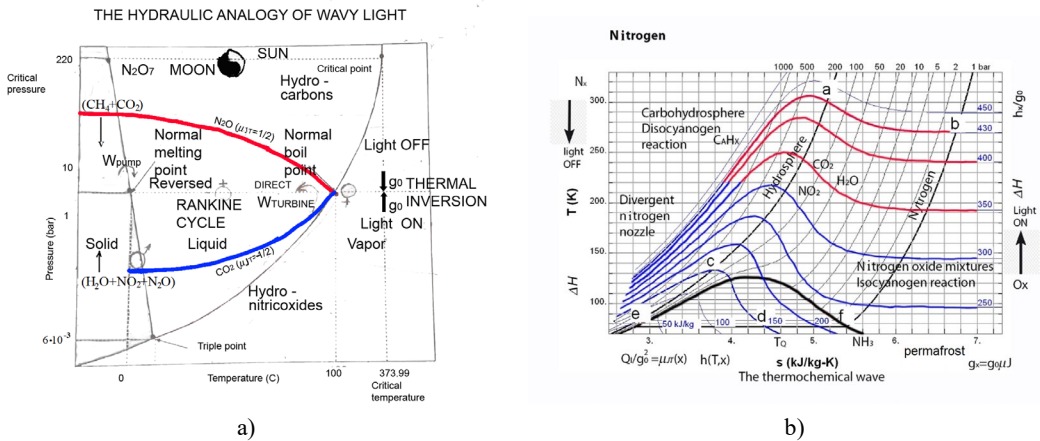


Fig. 6 The logarithmic analogy of wavy light: a) the nitrous oxide (N2O) – carbon dioxide (CO2) interface immersed in water:

$$p_c = (m_{H_2O} \cdot g_0) + 2g_0 = 216 \text{ bar}, T_b = \frac{m_{H_2O} \cdot g_0}{X_{atoms}} = 60^\circ\text{C}$$

$$p_{TP} = (m_{H_2O} \cdot g_0)^{-1} = 6 \times 10^{-3} \text{ bar}, \mu_{JT} = \frac{T_c(K) \cdot p_c(\text{bar})}{1000 m_{mol}} = \pm 1/2 \frac{N_2O}{CO_2}$$

b) the nitroxide (NO)_x thermodynamical waves

5. CONCLUSIONS

The quantum self-contained system timelessly regenerating is proposed for the solar system, based on the postulate of wavy light and a new interpretation of the Mendeleev’s periodic law, involving the reformulation (enthalpy, internal energy and entropy) of thermodynamic principles of a quantum nature and the unified electrodynamics, involving astrophysics. Essentially, it is a phase theory, which conciliates the three conceptions: Newton (s(t) infinity

expanding), Einstein (the curved-spacetime theory of gravity), the timeless regenerative self-contained space (a phase theory).

Briefly, the Earth is a regenerative self-contained geocentric system with a carbon (*TP*) cyanogen pole (North) and a nitric oxide (*NO*) pole (South) occurring the Golf-stream (warm) and Oyashio-stream (cold) to swing round the quantum (e/π) torsion axis or electro-thermodynamic axis. The solar regenerative system is an autonomous electro-thermodynamic complex/compact, its working being little understood by “MAN”.

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