Title: Is production of energy "for free" feasible in a PhR perspective?

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Abstract: *The Physical Reality (PhR) model presented last year in viXra.org/abs/16040230 is the outcome of an alternative approach to studying cosmic behavior. It implicitly extends the principle of energy conservation to the whole cosmos since its creation out of nihil. This article concludes that under this scenario an attempt to produce energy "for free" would not necessarily be doomed to fail. Indeed, a global energy conservation rule does not conflict with a partial and locally valid version as proposed by Physics.*

1. Physical reality and energy: a summary of Ref1's consequences.

- The article mentioned above (in this text referred to as Ref1 – a good insight in its content will help to understand this article) has made some statements about energy that are at least valid in a PhR approach.
- *An outline:*
  - *In order to describe PhR, this text draws on a number of terms (like energy) that are commonly used in physical theories (e.g. thermodynamics) . This might give rise to confusion. Although there can be no conflict between PhR and proven physical laws, most of those will apply to observable properties of cosmic states that will only emerge after some steps in the evolution (e.g., the term "temperature" has no equivalent definition at point level). This PhR model assumes, however, that the same underlying behavior at the lowest level of detail (the CPS point level) remains valid and active throughout evolution, which requires universal definitions of elementary properties and generic behavioral rules. The same terms, then, will be used in those cases where the link between PhR and physical terms is strong or obvious.*
  - *A generic but abstract definition of energy needs to be given (in Ref1: "the capability of a pattern or set of patterns to change the state of the cosmos"). This definition, in combination with a number of fundamental conservation rules, implies that any change in the state of the cosmos has an impact on the energy density distribution in spacetime (the few examples below are not exhaustive). Physics itself, by the way, does not give a clear and universal definition of the term or property "energy".*
  - *The single so-called fundamental discriminating property that was able to "break" the state of perfect symmetry of cosmos(0) (in fact, an ideal empty state) has been termed "charge" (see Ref1) . The isolated charge quantum "injected" in cosmos(0) by a single creation event was the only uncompensated amount of energy needed to generate, step by step, the entire*

cosmos up to its present state – an evolution that was driven by the impact of the same 6 base laws on successive cosmic states.

- *All other discriminating properties appearing in the course of the evolution can be logically deduced from this fundamental property type without the need for any other creation events.*
- *When limiting the state of any particular version of the cosmos to its charge (and non-charge or hole) density distribution content (reduced to its lowest point level composition), we focus on a static form of energy. Any perturbation of this situation due to the impact of an unbalanced charge info emission pattern produced by whatever previous cosmic state components, demonstrates that (charge) information has to be considered as an equivalent but dynamic (or active) form of energy. The cosmic evolution, in accordance with the base laws, is the outcome of iterative transformations of static and dynamic forms of energy into each other. This PhR mechanism seems to be at least conceptually consistent with physical theories like Maxwell's laws in electromagnetism (charge driven) or Einstein's tensor equation (hole driven) in general relativity.*
- *Any pattern that is the owner of a discriminating property versus its direct environment poses a form of potential energy. In order to effectively change the external cosmic state somewhere, an interaction with a version of a compliant pattern (mostly at the level, and in the appropriate state, of one of its components) is necessary, a process that takes place in accordance with the base rules of PhR. Therefore, its impact must obey all relevant elementary conservation rules (e.g. charge conservation or CPT conservation over interacting objects).*
- *No more than two patterns can be involved in the exchange of a charge info package at exactly the same time. The content and the meaning of the term "info package" depends on the class of pattern as well as on the interaction type and determines the probability and the outcome of an interaction process.*
- *Any exchange of charge info quanta will affect the interacting objects in opposite (in the CPT sense) ways. A distinction has to be made here between the modification of a property already stored in a pattern (e.g. momentum) and the structural modification of a pattern's layout. In the latter case, and in so far as these effects are to be considered as new discriminating properties, their impact, expressed as absolute quantities of energy, will be often qualified as positive and negative . A +/- sign not only qualifies a pattern's property, but also implies that the external impact of charge info emitted by coherent owners of this property may cancel out. This being said, we have to take into account that overall conservation rules apply for pattern components that do not coincide in spacetime. The fact that in this way energy quantities and signs are used to express totally stored amounts as well as transaction amounts to be added or subtracted, could be*

misleading, though in general the context makes their distinction clear. In physics, this situation is less common, because amounts of energy stored are often expressed in relative figures, not as absolute numbers.

- *If several components of the same pattern more or less simultaneously possess a similar interaction capability (e.g. several phase shifted connectors of a simple or complex particle), overall conservation rules apply, which means that the net charge quantum, i.e. their algebraic sum per relevant particle version, remains equal to the initial amount (see base laws). An example (in physics) is the charge distribution in a neutron: its net amount of charge is null, but several components quasi-synchronously have + and - charge quanta, distributed quite precisely over spacetime in the course of a particle's replication cycle set. This explains its observed small non-zero magnetic momentum (a charge info distribution pattern). Another similar case is a net charge info disequilibrium (a polaron quantum) in a fotino (an elementary component of a photon pattern without a net charge amount).*
- *When an elementary pattern (e.g. an UZS zeron) with a particular discriminating property goes through the contracted state (see Ref1), the exchange of charge info between its subsequent states may be such that CPT conservation leads to opposite values for that discriminating property. That situation implies that the sign of the corresponding amount of internal energy will change as well. However, the overall amount of energy over different types and components (including charge info) and spread over spacetime, will be conserved (PhR behind the CPT conservation rule as an extension of the C conservation mechanism).*
- *Two fully identical patterns close to one another (in space or time – a hypothetical but not very realistic situation) would never change each other's states in any predictable manner, only in a heuristic way, a process leading implicitly to distinct modified states of both objects.*
- *In PhR terms proper to steady states, owners of energy are point (CPS)/ zeron(UZS) patterns or sets of patterns. The capability of a pattern to adapt its internal layout in a cyclical manner by charge info exchanges between its components (e.g. in case of replication) represents an amount of internal energy. This quantized periodic change needs a net equivalent exchange of charge info with the environment (including the CPS and UZS framework – see Ref1) in order to compensate any temporary internal disequilibrium – which is, according to the generic definition of the term "energy", a form of external energy.*
- *Nevertheless, the term "external energy" in this (con)text rather refers to excess or free energy available in special pattern states, enabling an heuristic isolated or periodic change of the (energy) state of a compliant pattern under the right conditions in its direct environment. This available unit excess is usually a small fraction of the (partial) internal energy stored in the pattern itself. Partial amounts are on average and to a large extent*

(internally or in combination with the UZS/CPS framework) compensated over all the components of the replicating pattern. The remaining disequilibrium is mainly stored in a pattern's connectors. Compliant patterns can be classical particles or field patterns (e.g. EZP's).

- *A third type of energy in a pattern's life cycle consists of the occasional release, in unbalanced special states (the contracted or the return state), of new autonomous patterns which in their turn possess a small amount of internal energy (difference particles – examples are photons, neutrino's or even electrons). Many of the patterns present in our cosmos are contributing to dynamic energy balancing processes by combining these three energy types.*
- *As stated, a typical discriminating property can be shifted subsequently in spacetime between several components of a pattern, taking its evolving growing and shrinking process into account. If, to give an example, a pattern has an excess charge quantum as one of the discriminating properties that impacts its behavior in spacetime, the component (a connector) that effectively possesses this quantum at a particular moment in local time can change many times in the course of the pattern's life cycle, a dynamic process that takes internal and external symmetries in space and time into account .*
- *The rate at which a pattern's potential energy can be converted effectively into external energy through an exchange of info quanta with surrounding patterns, is a statistical matter, but depends to a large extent on the carrier/possessor's internal layout. For example: a closed EZK antenna hit by an extra action quantum h/2 will start to replicate. The higher its maximum string length (I-max), the longer its period (twice a version's lifespan) and the smaller its effectively convertible amount of internal energy per conventional unit of time. This statement is consistent with the fact that a particle is able to exchange info quanta with surrounding patterns in its I-max state only. The probabilistic side of this phenomenon obviously depends on the number of nearby valid patterns to interact with, a parameter expressed as a pattern density figure over a volume that is relevant to a particular kind of successful interaction.*
- *Each successful interaction has a quantized impact expressed basically as an amount of action (h/2 or h), i.e. the combination of energy and time amounts, both necessary to change once or twice the (charge and hole) state of a single CPS point in the contracted state. Such an action amount materializes itself a quantized charge info pattern emitted by an antenna (a changing pattern component – see base laws) and is a conserved quantity, although the outcome of such an exchange process on interacting objects can be different. This means that the ultimate impact of the action's time and energy components on the emitter and the receiver involved, is not necessarily equal. In the same vein: total energy amounts are conserved, but the spread over internal and external effects may differ for the two patterns.*

- *In this context, a distinction has to be made between real particle interactions and the release in the UZS/CPS of difference particles; and between effective single interactions and double synchronized charge info exchanges or bifurcations, the latter requiring complex patterns with components in a coherent anti-symmetric state. This situation needs special environmental conditions (local or global CPS/UZS states with in spacetime balanced charge and hole densities – we refer to these conditions as <u>flat curvature</u> states), a requirement that has, in any case, a statistical character.*
- *The observable range of phenomena following the impact of an interaction on both patterns involved has been mentioned in Ref1: it can lead to internal processes of growth and contraction starting from a mutated nucleus antenna, the emergence of dual particles (matter and contramatter), the decay of a particle or the bonding of two spin ½ patterns into a temporary stable spin 1 pattern (e.g. a meson), etc. Any change of a momentum due to polaron exchange(s) between interacting particles (including dark matter EZP density distributions materializing a gravity field) implies a change in I-max value of a replication cycle. This will impact the periodicity of the life cycles of both particles involved, and as such, their energy content as perceived by their environment: a replicating pattern interacts exclusively with its environment in I-max, so per second there are more or less "active" states depending on the string length I (the number of knots or nodes) of a particle.*
- *Any process leading to a change in momentum of two charge neutral patterns, exchanging polaron-type information, has to respect a CPT conservation rule. If both particles involved have the same mass type, an increase in momentum of one of them implies an equivalent decrease of the other, leading to an increase and decrease in velocity (and / or mass – see SR). If both have opposite mass types (a phenomenon we will describe below), both can display an increase in velocity in opposite directions with a reduction of their I-max value. If they emerge in an immobile state starting from an identical I-max value, this value remains the same after polaron exchange, which implies that both patterns continue to interact effectively in a repulsive manner. The outcome is that in a young cosmos separated sets of charge-neutral particles with the same mass type and subject to a condensation process acquire a high amount of momentum, leading to very intense chaotic collisions between them. If we take Coulomb effects into account, energy distribution and its evolution in these volumes becomes fairly complex*
- *In the information exchange and coupling based scenarios just mentioned, there is no need to introduce a term like "elementary force" (Physics) to describe a particle's behavior on a double grid. Any change in position is due to charge info exchanges between elementary patterns.*

- *The transition between previous terms and rules as applicable to micro-patterns and those described by classical Physics for macro-objects, is a matter of probability of these micro-processes to take place at increased levels of complexity. Hiding low level cyclic behavior, averaging results over high numbers of components or using approximate figures to express measured properties, are all techniques frequently used to describe nature at a macro-level but their outcome has to be consistent with and driven by the behavior of the underlying micro-components and processes.*

- This selection of statements has set the global scene for energy issues in a PhR context: in the following paragraphs, we will focus on a class of processes that take place in a UZS spacetime filled with patterns possessing a central zeron antenna (EZP, EZK, EZO). They emerge spontaneously (e.g. in a young cosmic shell) or artificially (e.g. in certain scientific experiments) and are, when they replicate, at least partly reconcilable with particles in physics.

- Finally: any statement made in this document will, as a matter of course, presume (in a PhR context) the basic cosmic model put forward in Ref1 to be valid – a presumption we will thus not feel bound to repeat at every turn throughout the following pages.

2. Large scale energy conservation scenarios.

- The most direct, but also the most unexpected outcome of the Ref1 model was the spontaneous emergence in the UZS of dual matter and contramatter particles, a process with a high probability under unbiased spacetime conditions.
- In a young super-symmetric spacetime slice such conditions are indeed omnipresent, due to the fact that primitive zeron collections (UZS N-dim volumes in M-dim point spacetime) are intrinsically, and on average, charge and hole density neutral. Furthermore, point interactions between adjacent zerons in i-max, leading to shrinking of their replication pattern, are statistically spread over an N-dim sphere in a perfectly isotropic manner.
- The outcome is such that huge quantities of dual identical matter and contramatter pairs (neutrons and contra-neutrons) emerge spontaneously in an extremely short lapse of time in any young cosmic volume. They are the result of single heuristic bidirectional axion exchanges under critical conditions between two zerons that are components of two anti-symmetric EZKs of a common EZO complex.
- The two subclasses have "dual" anti-symmetric sets of properties: opposite mass signs (<u>identified as small positive or negative differences in point-hole density ratios versus an ideal standard CPS density value</u>), opposite zeron and string rotation directions and, finally, when neutrons decay into proton-electron pairs and form atoms, opposite charge signs for each of them. Contramatter charge signs are indeed equal to antiproton-anti-electron signs but contrary to these, matter-

contramatter pairs have opposite mass signs, their replication processes make use of different sets of dimensions, and they show no tendency to annihilate as particles and antiparticles do.

- When large volumes of matter and contramatter atoms start to separate (a CPT conservation issue, in the contracted state as well as under axion and polaron interactions in the return states) the most common scenario (e.g. in our galaxy) is that they will both condense into two disjunct subsets made up of, respectively, stars and contra-stars , each behaving according to similar mechanisms. These two sub-collections are characterized by a distribution in spacetime that, at least theoretically and in relative terms, will be geometrically eccentric or centric.
- “Centricity” entails large scale spherical condensation around a common symmetry center along different dimension sets and a layered structure, with each pair of concentric layers separated by a dynamic horizon, i.e. a thin region where electrons and contra-electrons face each other at an extremely short distance, enabling static Coulomb interactions and /or weak (=axion) interactions but no virtual photon (=polaron) interactions – as stated before annihilation as such cannot take place. These horizons are curved surfaces on a large scale but can be locally flat. The small scale PhR effects due to so called “flat” (see next chapter) states in contact areas will be rather particle related (as carriers of persistent holes and free charges). If this situation would indeed exist (a highly speculative assumption) it could explain e.g. the PhR behind the periodic changes of magnetic field orientations of stars like our sun (maybe even of a planet like Earth – this would imply that Earth still contains one or more deep, spherical contramatter shells, i.e. potential sources of nuclear energy).
- Eccentric condensation (an observable and confirmed scenario) entails the emergence of particle configurations like our galaxy, with huge numbers of stars and contra-stars surrounding each other. This means that the main discriminating property in a horizon area is exclusively hole density based. Flat curvature here is mainly related to dark matter distributions made of EZP and contra-EZP densities surrounding central anti-symmetric matter and contramatter objects. The layout of the single but dynamic horizon can be rather complex: it is locally flat but typically hyperbolic in a reference frame with its origin in a virtual contact location.
- It goes without saying that statistically, as well as for reasons of symmetry, our cosmos cannot but also contain contra-galaxies – with visible stars at the center, surrounded by dark “empty” belts filled with invisible contra-stars, configurations that have been observed often enough but remain unexplained (e.g. Dragonfly 44).
- This theory about two hypothetical matter/ contramatter condensation mechanisms that guarantee large scale energy conservation typically belongs in the realm of cosmology and will therefore not be treated in further detail here. However, a few consequences are worth mentioning:
  - The process described above is a detailed version of what we could call a continuous Big Bang and inflation scenario. An alternative “one-off” scenario as proposed by conventional cosmology provides no satisfactory

answers to a number of fundamental questions: What is the source of the total null-energy of all “matter-like” particles in the cosmos, and where did all antimatter go (ostensibly necessary to conserve charge in a young quark made cosmos)? What about troubles with the cosmological principle: the fact that fundamental physical constants are assumed to be identical in the cosmos over distances between locations that cannot be bridged by information exchange at the speed of light? Correctness of global cosmic curvature calculations needs large quantities of dark matter and dark energy – what and where are they? How to reconcile the idea of a single Big Bang with an increased inflation rate for distant (in space and time) galaxies, a phenomenon recently observed? And above all: if a (hypothetical) process like the Big Bang really were to be at the origin of our cosmos and its evolution, would it not in and of itself be in conflict with a physical theory that makes use of a universal, but solely positive energy conservation rule?

- In this model, a gravity related energy type will use the hole density (or mass) type as a fundamental discriminating element, responsible for the separation in spacetime of huge particle and contra-particle volumes. For both, Einstein’s $+/-E=+/-mc^2$ is valid, although it remains to be proven that c- values in UZS regions dominated either by matter or by contramatter would be exactly the same (leading to fine structure constant values slightly above or below 1/137).
- A strong argument in favor of this PhR model is that once a partial cosmic volume is locally in a stationary state (e.g. our galaxy), it shows a <u>net</u> amount of external energy that must be, at least in terms relative to its internal energy fractions (this includes all internal forms of electromechanical energy and gravity), very small – indeed, bear in mind that this model took NIHIL as its starting point and assumed a “creation event” inducing a single and negligible charge quantum. All other forms and amounts of energy that emerge afterwards, as a result of the new and persistent discriminating properties of ever more complex patterns and interactions, have to cancel out over representative sub-volumes (matter and contramatter) of spacetime (e.g. as occupied by a galaxy). This implies that scientific paradigms (Physics) that are based on observation and use instruments that cannot measure the contramatter properties of local or distant objects, will inevitably leave this energy type out of their calculations. To explain nevertheless the large scale behavior and stability of our cosmos, a lot of unproven assumptions have to be made about e.g. black holes, dark matter and dark energy, super-heavy particles …

3. A definition of the term flatness in a PhR context.

- <u>Flat</u> is synonymous with <u>unbiased</u>, and refers to a stochastic, but on average homogeneous distribution of the impact of net charge info (see base laws in Ref1) on CPS/UZS states in a representative spacetime volume over an appropriate number of dimensions. In this text and for practical reasons the term flatness will be used for any local and/or global condition in the CPS/UZS grid that would enable, with a probability high enough to be observable :

- the spontaneous emergence of EZO-type zeron patterns,
- bidirectional axion exchanges along shortest distances between two anti-symmetric zerons that each belong to one EZK of such an EZO,
- double replication processes driven by both mutated EZKs, taking place in each proper subset of dimensions.

- We will make a distinction between global flatness in a very young (i.e. mere fractions of a second old) CPS/UZS volume lacking particle patterns, and local flatness. The latter springs from the presence of surrounding coherent patterns maintaining, albeit statistically and for a short term, flat conditions in locations that are impacted by their properly synchronized emission and polarization specter, even if this takes place under global non-flat spacetime conditions. This situation may be either the outcome of a spontaneous cosmic evolution or of an artificial, experimental set-up (if such a distinction needs to be made at all – we are of course part of the cosmos and its evolution, and our behavior must be PhR compliant).
- It may be helpful to compare the present state of the UZS with the situation in a small volume of a globally flat cosmic spacetime slice at the time of its origination. Let us assume (by way of example, as the order of magnitude remains unproven) that a zeron has a maximum size, expressed in contributing point numbers determined by its constant i-max value, of 10exp(8) points, and that an EZK contains 4 adjacent zerons, putting a particle's absolute antenna size (10exp(-25) m) in the middle of a length scale delimited by a Planck length (10exp(-34)m) and the experimentally observed size of a proton (10exp(-15)m) . If we compare the particle density in a virtual volume of the UZS that contains 1 mol of hydrogen with the zeron density (even in 3 dim) at a specific moment in a local UZS based time frame, we can safely say that the relative number of zerons in this volume involved in the formation of a single version of a proton pattern is, on average, only a tiny fraction of the total number of surrounding UZS zerons. This somewhat simplistic estimation will then have to be adjusted for all kinds of reasons, e.g. the much more dense presence of EZPs (dark matter materializing gravity fields) or the dense random emission of non-static charge info quanta or polarization effects (e.g. Coulomb fields), all of them having a dynamic and important impact on local spacetime curvature.
- Nevertheless, our presupposition remains important, as it explains (among other things) why certain parameters in physics (like ε and μ and indirectly c) are, on average, not very sensitive to fluctuations in particle densities, at least if they are smaller than those in biased condensed matter states (they are, in fact, nothing but small perturbations of flatness). In brief, reaching flat curvature conditions, in a random location in a stochastic UZS volume and for a short period of time, does not seem to be a priori impossible, not even in our own local, on a large scale

slightly curved (by positive dynamic mass distributions) spacetime volume. Even without "artificially" increasing (or decreasing) the probability of flat curvature conditions for such volume, an appropriate EZO state will "now and then" appear spontaneously – despite its behavior (e.g. its decay) being hard to measure.

- Flat conditions, like anything else in our cosmos, have a stochastic nature. They refer to a statistical distribution in space and time and dimensions (contact locations with neighbor zerons) of coherent zeron subsets (and their corresponding charge info emission pattern) in phase-critical states (i-max). Whenever an accidental EZO combination is present in our local curved spacetime volume, it must be able to replicate instantly and permanently in order to become an observable particle. A successful replication process needs the (dense) presence of enough compliant objects with a correct discriminating property in the appropriate subset of dimensions: e.g., if an EZO in a globally flat cosmic volume is able to emerge and to replicate synchronously as a neutron and a contra-neutron pair, this hints at the local presence of enough balanced positive and negative excess charges and holes, who are either maintained by both types of UZS zerons, or make up part of free EZP patterns (this rule remains generically valid throughout the cosmos, even for something like growing plants).
- In a later phase of evolution a similar charge or non-charge based flatness can be achieved through the presence in spacetime of <u>appropriate pattern distributions</u> in the UZS/CPS. These are either EZP's or EZK based particles. In a such an approach a "spooky action at a distance" (Einstein) does not exist. Spacetime curvature (charge or hole driven) and the micro-behavior of patterns are part of a single, consistent model:
    - Any local equilibrium is intrinsically dynamic: a <u>Coulomb-like charge distribution</u> , constituting a field, is a quasi-linear chain of polarized UZS zerons "produced" by a "free" persistent unit charge in I-max of a particle connector. The source of this effect is itself short-lived, and the next polarization direction of a free charge antenna may be rotated after reflection of the pattern in the contracted state. Each single version of a polarization zeron string will not disappear immediately when the source of polarization (a connector zeron) will shift over the UZS as a result of replication. The two zerons at the end of an UZS polarization chain will flip their states coherently (albeit with a slight delay) like any ordinary UZS inter-zeron coupling (DZ-DH-CZ-CZ). In physics, a Coulomb field around a free charge is implicitly treated as an abstract 3D quasi-static radial distribution of virtual field lines, a useful, but nevertheless misleading representation of PhR. As it is, a Coulomb field's spatial distribution is not limited to a common 3D space: we only "observe" its 3D distribution because effective interactions between two particles require properly aligned "average" replication directions along a shared 3D set. Between two interacting particles, connecting polarization lines are obviously aligned along the same common directions. Dynamic charge distributions might produce cyclic <u>residual charge info fields</u> at particle level observed as magnetic fields in

physics (e.g. magnetic spin). So it would be better to broaden the term Coulomb fields to "electromagnetic fields", as magnetic effects are curving spacetime as well.

- In our cosmic volume, the hole (or mass) distribution is biased along certain dimensions fixed at the time of condensation towards a dynamic, central symmetry center of huge numbers of particles. This process initially created a central symmetric EZP distribution (a byproduct of any accelerated replication cycle with gradually decreasing I-max values) along 3D dimensions materializing a radial density gradient, thus producing and sustaining an observable gravity field (emptiness alone is unable to maintain a persistent hole pattern, it needs the presence of a non-moving charge distribution to pull this off). In Ref1 we stressed that the passage of a particle through an existing gravity field absorbs and then releases again the EZPs that contribute to its motion, in this manner restoring (or increasing/decreasing, in the case of radial motion) the original density distribution.

- Non-appropriate distributions (charge and hole densities) could prevent local flatness to exist in an observable number of cases. On average flat charge distributions require grid-like coherent particle patterns (e.g. doped crystals) but even under these artificial conditions, any spontaneous outcome of EZO presence is not necessarily observed.
- The large scale dynamic hole distribution, intrinsically biased by non-moving EZPs (gravity fields) as well as by moving particles themselves (GR conform spacetime curvature in physics), prevents indeed the spontaneous production of neutron-contra-neutron pairs, although the production of neutrons alone remains at least theoretically feasible if the surrounding particles provide the appropriate amount of energy along the appropriate symmetry lines.
- All this looks rather obvious, and explains the classical and limited energy conservation rule, but we must not forget that in a PhR context the emerging replication schema of a particle requires anti-symmetric charge info distributions in the two branches of a string in order to maintain the EZK nucleus oscillation process. Their short dimensions are different from the 3D average dimensional directions that we observe in physics. In this respect, proper charge info exchange itself is crucial, and in combination with the right orientation (the P and T in the CPT conservation rule), complex multi-dimensional patterns (e.g. crystal lattices) are able to locally substitute effects proper to simple charge distributions even in an environment that is not globally flat. Observable properties of a particle have a marginal character and always refer to connector properties in I-max.

4. Local flatness and its outcome in an energy conservation perspective.

- As physics does not allow of any exceptions to its strict energy conservation rules as applied to observable processes (and encompassing all types of energy), there would be no use for this paragraph in a classical context. However, taking encouragement from what happens in a continuous big bang scenario, we have to evaluate the possibility that on a relatively small and local scale, equivalent particle-contra-particle processes have a chance to take place at an observable rate. We will make a distinction between spontaneously and artificially emerging phenomena.
- If we focus on spontaneously emerging flat conditions with a significant impact, the obvious candidates are spacetime volumes close to gravity horizons, areas where huge volumes of separate EZP densities biased by matter and contra-matter, each with anti-symmetrical charge distributions, face each other. These dynamic virtual surfaces act as sources of new particle and contra-particle pair creation processes, emerging randomly from the "birth" of a galaxy like ours on. The outcome, going hand in hand with a spatially distributed condensation process into stars and contra-stars– each containing numerous matter and contra-matter atoms - and assuming a slight rotation of the core contra-star group in the opposite sense as the peripheral star group (they have anti-symmetric properties), will be the gradual growth, throughout Evolution, into the kind of gigantic volume of mega-patterns that is our galaxy.
- In the course of this process, the location of the horizon will gradually shift away from the symmetry center of an expanding galaxy volume. This shift must account for the anomaly cosmologists observe between the velocity of peripheral stars on their orbits around the galaxy core and the gravity force produced by a hypothetical black hole at its center and limited to a virtual volume inside the star group. We assume that our galaxy has reached a steady state, although according to cosmologists, new stars are still born each year. On Earth, something we might be able to observe of this ongoing matter- contra-matter creation process would be the arrival of an endless stream of "cosmic rays" – in fact, a shower of new particles caught by our gravity field. As long as these spontaneously emerging and replicating particles are accelerated over the UZS grid under quasi-flat conditions at extremely low velocities and high I-max values their photon emission spectrum should match the cosmic microwave background radiation as observed.
- Typical of young(er) stars is that their isotope composition consists almost exclusively of hydrogen and helium. In a globally flat spacetime volume at the time of a large scale, continuous big bang process, emerging neutron / contra-neutron pairs have large I-max values and low mobility. The period of their decay into electron-proton pairs could have been larger than its actual value (+/- 881 sec.). So initially the full range of isotopes of chemical elements had a certain probability to appear as the outcome of an initial contraction of multiple neutrons around a common symmetry center, not as the result of subsequent (step by step) interactions between full nuclei with low(er) atom numbers . Although the difference in outcome is rather subtle, it is obviously more straightforward (in PhR terms as well as in physics) to add an extra neutron to an existing isotope nucleus,

than to merge two positively charged nuclei. As a consequence, the nucleogenesis cycle in the classical way as proposed by cosmologists has to be critically reviewed at least for "older" stars or for other interstellar objects with a similar matter composition (planets, comets, etc.).

- As for horizons between hypothetical centric layered matter-contramatter distributions the situation could be much more complicated. Although this process could be important to explain (e.g.) the cyclic behavior of our sun, this topic is too complex and speculative and is therefore left outside the scope of this document.
- All these large scale phenomena respect implicitly any global energy conservation rule as they originate from the creation of equal amounts of (dark and ordinary) matter and contramatter and are driven by the same laws and rules that dictate the electromechanical (be it anti-symmetric) behavior of both subsets.

- A good example of small scale, but spontaneously and frequently emerging phenomena could be the occasional flat conditions in dynamic and organic 3D structures as created and maintained by linear chemical molecules like enzymes. The earlier discovery (see Ref3) of plants and animals containing chemical elements that, apparently, had not been imported from an external source, prompted the theory that, under certain (unexplained) conditions, complex organic 3D structures (eventually sustained by bacteria**)** might be able to induce transmutations of certain nuclei (e.g. K isotopes transformed into Ca). Flying in the face of accepted paradigms, it was, unsurprisingly, rejected by the scientific community; and as in-depth scientific investigations in this domain are lacking, we prefer to leave this group of phenomena out of the scope of this article.

- As for artificial flat conditions, a rapidly growing body of published results of controlled transmutations and cases of energy production in properly conditioned crystal lattices warrants attention. There seems to be a consensus that, by now, those results have become too numerous to be brushed aside as the products of fraud, fiction, or badly prepared tests. In this text, we will call them LENR (Low Energy Nuclear Reactions) phenomena, as they presuppose non-chemical mutations that take place under standard environmental conditions (i.e. at low temperature , without producing radioactive waste, etc.).
- The first "discovery" of this kind was made in the 1980's by Pons and Fleishman (see Ref2) with a test set using a purified palladium cathode saturated with deuterium (after an initial loading phase) and enclosed in an electrolysis cell filled with heavy water. Every now and then, they measured a small temperature increase caused by an unexplained release of energy, and the simultaneous transmutation of palladium nuclei into other metal isotopes. The effect was small and the outcome unpredictable. Despite their efforts to enhance the results, the scientific community has never taken their observations seriously.
- In that respect, the more recent, so-called E-Cat results (Cat is the abbreviation of an electrolysis cell named "Catalyzer") are much more convincing, and despite a

lot of skepticism from traditionally minded scientists the existence of these phenomena can no longer be denied. The setup (although reliable details have never been published) involves an electrolysis cell containing small Nickel crystals (as one of the electrodes), saturated initially with Hydrogen atoms and suspended in a catalyst liquid containing (among other unknown things) a Lithium complex. LENR reactions take place at not very critical temperatures between 100 and 1000° Celsius.

- Scientific arguments against these results are well known and come down to 4 major types:
    - A nuclear reaction between positively charged atomic nuclei requires a high temperature in order to have a measurable chance to cross (to tunnel in QM terms) their repulsive Coulomb barrier.
    - A reshuffling or mutation of the QM state of a nucleus will result in the emission of radioactive waves or material (alpha, beta or gamma rays), a phenomenon that in the case of E-Cat is, in fact, present, but the effect is so small that it is hardly measurable.
    - The isotope composition of Copper as the usual outcome of Nickel mutations is the same as its statistical distribution observed "in nature" where on a theoretical basis, and in accordance with some classical theories about initial nucleogenesis processes, their composition must be different (so the conclusion was that this Copper was fraudulently put into the catalyst before or after the test in order to make the results more credible). Also, and inexplicably, small traces of other metals have been found as reaction products in the Ni-raster whereby the isotope composition of Ni before consumption is assumed to correspond with the natural distribution.
    - As there is no consumption of material and at first sight no overall loss in internal (nuclear) energy in the lattice atoms or in the grid itself this phenomenon violates the never contradicted principle of conservation of energy.

- One of the older theories that addresses a number of these "arguments against" we owe to Widom-Larsen (Ref4). It assumes that a Ni (or Pa) raster intensively "loaded" with H (or D) particles can spontaneously generate slow neutrons with high cross sections due to so called "collective weak interactions". If this is true, most objections disappear, except for the energy conservation issue. In order to produce the amounts of energy involved as announced for E-Cat, the gain must stem from transmutations with a substantial difference in energy per particle value between the isotopes involved. A favorite candidate is a conversion of Li-atoms into Helium, a sub-product that will itself escape from the catalyzer. The amount of energy released per successful interaction is in the order of 20 MeV, an enormous figure compared to the amount of just a few eV released in chemical reactions. The use of Li in E-cat to convert the potential free neutron energy into heat may explain why Pons and Fleishman never succeeded in producing comparable gains in energy.

- The main weakness in Widom-Larsen's theory remains the unexplained unbalance in energy. A phenomenon that spontaneously produces slow neutrons in the Ni-lattice would either have to extract energy from the lattice (which, in that case, would cool off and thus prevent the process from going on for 6 months) or be compensated by an equivalent loss in internal energy (at atomic or subatomic level) of the lattice components themselves. However, the production of every neutron "out off the blue" requires an amount of energy of at least 940 MeV, which makes that the hypothesis of an energy gain balanced by an opposite and equivalent lattice mutation amount sound rather implausible.
- A PhR based explanation, on the other hand, convincingly answers all the objections against LENR:
  - Slow neutrons are able to tunnel Coulomb barriers.
  - Neutron-contra-neutron pairs emerge directly from an anti-symmetric UZS pattern that in absolute terms stands still on the UZS grid. The neutron's initial I-max value shows an absolute maximum. Its initial momentum is zero, which makes it possible to absorb (but not to emit) photons (gamma rays). The only form of radioactivity would come from the decay or the reshuffling of mutated Ni nuclei, or from other radioactive isotopes emerging accidently.
  - An isotope composition similar to what has been found in nature is not unexpected, at least if the mechanism of nucleogenesis proposed earlier in this text is applicable to natural copper minerals found at the surface of the earth.
  - Finally, according to this PhR model, there is no energy deficiency: the initial internal energies of a neutron and a contra-neutron balance against each other, but the contra-neutron's opposite contribution is not measured by science. We assume that these particles escape from the test without being involved in an axion exchange (in PhR terms - in Physics this corresponds to a weak interaction). Such an interaction is theoretically able to exchange energy, but would have an extremely low coupling factor (similar to neutrino interactions with matter).

- The impact under experimental conditions of slow neutrons on metal isotopes explains equally their transmutations, a process especially observed and studied by research centers in Japan.

- Obviously, all this presupposes the existence of locally flat conditions in a crystal lattice. With the energy gain per successful transmutation between a slow neutron and a Lithium atom (or 2 neutrons with two Lithium atoms), local flatness is a statistical phenomenon with a probability that will depend on several parameters and environmental conditions. Some of them will be discussed in the next paragraph but as an example we mention the dependence of the COP (Coefficient of performance) at least in principle, of the momentum state relative to a fixed reference frame (the UZS) of the full equipment used in an experiment. Slow neutrons versus the UZS are not necessarily slow in a reference frame linked to the catalyzer equipment. This means that (due to the rotation of the earth and the motion on its orbit around the sun – we ignore the rotation of the milky way) depending on the date of the year, the hour and the location where the experiment takes place, the COP figures can be different. In a same context the measurement of a high external neutron flux does not imply that these (versus the UZS very slow) neutrons are as destructive as fast neutrons emitted by a traditional radioactive source linked to the catalyzer (on PhR ground: their I-max values are different). This distinction between absolute and relative "slow" neutrons is worth to be mentioned as a potential research topic: a well prepared experiment would be able to prove the correctness of the PhR model at this point.

- The uncertainty about the energy production rate has probably been the cause of two extreme and conflicting situations: the total failure of a test, and the explosion of closed E-Cat devices. That being said, the nature of an LENR explosion is very different from the kind of uncontrolled chain reaction process that would involve the massive escape of energy from a nuclear reactor. A fission reactor is designed to produce energy as the outcome of a controlled, but vulnerable process that intrinsically relies on the multiplication rate of slow neutrons, albeit in a well prepared and secured environment but one that is, nonetheless, filled with radioactive material (in theory: a potential atom bomb). In an LENR experiment, the production of massive amounts of energy and a sudden increase of temperature destroys the state of flatness in the Ni-lattice, which will make the process stop of itself. Obviously, a substantial amount of energy can be released in an extremely short period of time, and the destruction of an experiment cannot be excluded – but this will never produce consequences even remotely comparable to the explosion or the melting down of a nuclear reactor.
- In the next paragraph we will present a list of other parameters that, at least theoretically, could have a potential impact on the COP of an LENR catalyzer.

5. "Energy for free" and some theoretical and/or engineering concerns.

- Any project or solution that aims to use LENR as the ultimate non-exhaustible and clean source of energy for mankind in the future, must involve, at least in its earliest design stage, experienced solid state (or condensed matter) physicists who can deal with some fundamental parameters that have a potential impact on the distribution of flat locations in a doped crystal lattice (e.g. the impact of interstitial H or D atoms on dynamic Fermi energy levels (or surfaces) for conduction electrons in a Ni/Pa lattice). This is certainly the case if LENR processes would be used in a configuration where the location (in absolute terms) changes permanently (e.g. as a real time energy production resource – thus without averaging by intermediary storage - e.g. in a rocket or in a car). There is some suspicion that actual solutions produced by researchers active in the LENR field suffer from unreliable instantaneous COP values: actual figures are mostly published as averages over longer periods of time without guarantee that a fixed production rate at any point in time has been achieved. That could explain in part why the few investors in this domain are reluctant to transfer their knowhow and equipment to neutral organizations, like universities interested in LENR. Academic researchers would soon enough identify such issues, thus postponing the implementation of a marketable product for years. Obviously, the main reason could be that there are no candidates for active participation in such a project, as LENR altogether lacks a sound theoretical basis in physics: research centers fear for their reputation – nobody wants to be caught up in a second "Pons and Fleishman story".

- As for the fundamental physical parameters that should be taken into account, here are some examples:
    - The crystal lattice structure and composition: the two successful grids used up to now are Ni and Pa crystals, both with an FCC lattice. Not by coincidence, the two are also members of the same metal group in the table of chemical elements. The initial Ni / Pa isotope composition might be important, as well.
    - Saturation of the Ni (or Pa) grid through the absorption of substantial quantities of H (or D) atoms before the energy production can start (a loading ratio close to 100% seems to be needed) . These small nuclei can be stored in the central interstitial holes of the Ni grid and are fundamental to create flatness. It explains why spontaneous LENR like phenomena in pure Ni or Pa crystals do not take place.
    - The importance of CPT conservation we mentioned earlier is related to the type of atoms used to dope the lattice. This might indicate that the Coulomb (polarization) field by metal protons and by interstitial H or D atoms creates an net excess charge distribution field (and corresponding charge info effects) in virtual contact areas with a curvature flipping between a spherical and hyperbolic geometry. In combination with the free conduction electrons of Ni (or Pa) and H (or D), this dynamic state produces local flat conditions in micro-volumes.
    - A useful indication of the correctness of this scenario, is that LENR of Pa (an even number of excess electrons on the outer orbit) doped with H, or Ni (1 excess electron if we accept a $[Ar]3d^9\ 4s^1$ electron configuration) doped with D, fails to work. Equal numbers of EZK based spin ½ conduction electrons seem to be required although not as a persistent state :there is only one H per Ni cube and for D we have to accept the dynamic combination of a free and a bound (as part of the neutron state) electron. We assume that these electrons are paired and show opposite spin orientations: so the residual magnetic field in the crystal grid (a charge info superposition effect) has to be small. The periodic narrowing of their conduction band (thru Fermi

surface curvature cross over) and the use of a pulsed or alternate current in the catalyzer after loading enables the compensation, at least statistically and locally, of the intrinsic crystal grid curvature.

- So the end-to-end conditions of multiple dynamic Coulomb-like zeron polarization strings originating from EZK connectors that belong either to main grid components (Ni or Pa nucleons), or to the interstitial (H or D) grid, and dynamically compensated by slowly oscillating conduction electrons could explain an increased probability for the emergence of EZO-like zeron configurations in virtual symmetry centers in intersection locations between "virtual connectors" of these chains. The role of non charged nucleons (neutrons in the grid metal atoms) and indirectly of the isotope composition has to be further investigated. In the same context, the temperature in the cell is an important parameter because it impacts the average I-max values (and subsequently the momenta) of all the EZK based components involved.
- This complex situation would need computer simulations designed by experienced research centers in order to be confirmed.
- All this assumes in a PhR context that classical or even most of the quantum-mechanical processes are very slow compared to an axion based interaction needed to split an EZO in two replicating EZK's: indeed, a particle at speeds much lower than c does not move over several replication cycles (de Broglie).

- Other important parameters are:
    - The choice of the size of lattice crystals (and thus the ratio between their irregular surfaces and their volumes), their purity level (including the average percentages of raster defects), and any special treatment of its surfaces in the course of their production phase that might change their porosity. In this context: most of the successful experiments speak about nickel powder.
    - The filling degrees in a cell (degrees of freedom of crystals to move or to rotate).
    - The choice of the catalysis fluid (e.g. the presence of Li containing molecules or other substances and their concentration in the catalyst liquid) or in more general terms: the way Li atoms are integrated in the catalysis process in order to increase their interaction probability with slow neutrons (these neutrons show a natural tendency to escape from the e-cat device due to the motion of the earth relative to the UZS).
    - The physical layout of a catalysis cell (e.g. the simple fact that the apparatus is open or closed).
    - As stated before, the temperature in the cell but from a PhR perspective, in fact any environmental condition that could have an impact on flatness (e.g. the presence of an external magnetic field, if only to compensate for the

impact of Earth's magnetic field). It is obvious that when temperatures are too high, they will cause the Ni to melt down.

- The electric properties of the setup: the present solutions seem to require the presence of an electric current in the cell even after saturation of the Ni crystals with H atoms. The effect of other forms and strengths of artificial or environmental electric fields and currents (continuous, interrupted, pulsed …) needs further enquiry.
- The already mentioned absolute velocity of a crystal lattice versus a non-visible but fixed UZS grid. Its absolute momentum has an impact on the I-max value of replicating strings, although the effect on the state distribution of lattice knots (oscillating at non-relativistic speeds) and on free electrons in the metal is probably small.
- A similar issue is the overall lay-out of multiple-catalyzer configurations. Not only can their number (by averaging) improve COP-stability, but escaping neutrons (in fact they stand still but the apparatus is moving) from one catalyzer could effectively impact the COP of one of its neighbors.
- The way heat is transferred from the E-cat to the external devices that make use of it.
- Practical issues like maintenance requirements of a setup (how often the Ni crystals and the Li are "consumed" and need to be replaced).
- Protection, control and security measures with a potential impact on performance.

- Most of these parameters are a matter of common sense and are not related to a better understanding of PhR. Maybe the impact of many of them has already been investigated by the few research centers trying to understand this group of phenomena.
- Nevertheless, a better insight into PhR can be useful: the simple fact that slow neutrons are at the basis of a successful interaction means that a regular COP depends upon the fact that these neutrons must escape at a statistically constant rate from the location in the lattice where they emerged, but in such a way as to guarantee an efficient reaction with the Li catalyst (as stated already, they could indeed escape from the catalyst too without contribution to excess energy production). "Slow" means here: in absolute UZS terms (a PhR compliant rule, but in fact against all principles of Special Relativity). It seems unlikely that considerations like these have hitherto been taken into account.

- However utopian the dream of a clean, non-exhaustible source of energy "for free" may sound, the PhR model does point, encouragingly, to a successful precedent: the emergence of our entire super-symmetric cosmos out of NIHIL.
- Still, nothing is ever really for free: the ultimate cost of an amount of energy produced will always depend on the cost of an E-Cat device, the production of substantial quantities of well prepared Ni crystals (including eventually a change

in their isotope composition), the cost of Li (to the extend it is really "consumed"), etc.

- Another issue is the fact that an E-Cat produces energy in the form of heat, stored in and transported by the catalyst liquid. Whenever we want to convert heat into a more useful form of energy (e.g. mechanical energy and indirectly into electricity), we have to keep in mind what thermodynamics has taught us about the limits to the efficiency of any conversion process (Carnot engine, Sterling machine …) – something that is strongly related to, e.g., the temperature of the hot liquid used. Below a COP figure of 3, an E-Cat's overall gain in energy effectively converted into electricity, is too small to justify the total investment (rumors about COP values of more than 50 in what is called the "hot-cat" have to be confirmed). Obviously, if one were able to produce electricity immediately, i.e. within the catalysis process itself, the situation would be considerably different.
- There is no doubt that the development of a reliable final E-cat product, ready to be certified and sold, will take major efforts and substantial financial investment. But they may well pale in comparison to the kind of resources it would take to make that other old dream come true: the construction of an effective and controllable fusion reactor plant.

6. Conclusion.

- The main objective of this article is not to give candidate investors some appetite to spend their money on financing these new technologies, although in the long term, these investments could be in mankind's greatest interest.
- The true purpose is to present members of the scientific community with an example of how a better insight into PhR could reward us with some very tangible benefits, unlike what one would expect from a rather abstract theory that starts from nihil, uses un unconventional approach and reaches a number of unusual conclusions.
- And, conversely, if E-cat results were confirmed through sound scientific research procedures, they would lend support to the validity of this model.

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