On The Current Physics Crises and The Hierarchy Problem (Gravity: from Theory to Experiment and Technology)

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Abstract

The crises in fundamental physics is by now openly reported and acknowledged.

The new paradigm, based on the Network Model, quark field of baryons and mesonic nuclear bonds, proposes a reinterpretation of the Standard Model and fundamental experiments in quantum physics, that claims to resolve major debates, including the Hierarchy Problem.

Recall that the Electro-Gravity Magneto-Dynamics is the theory of the long range component of the quark field, which is yet missed by, for instance Yukawa potential, color QCD or chiral Effective Field Theory. The short range component described by the nuclear effective potential of chiral Effective Field Theory is consistent with Yukawa's meson model of nuclear forces, unified by the above approach.

The experiments verifying this model of Gravity are recalled: F. Alzofon and D. Sarkadi. Is there a relation between the two?

Further confirmations of the new Theory of Gravity come from of Podkletnov and Ning Li's research and experiments.

The new paradigm is claimed to be consistent with the already existing Standard Model, with its accurate predictions but containing historcal miss-interpretations, proposing a change in our point of view and goals.

1 Introduction

The Standard Model of Particle Physics has reached a "Kuhnian crisses" [4].

In this overview article we focus on the Hierarchy Problem, centered on the weakness of Gravity, when compared with the other interactions [26].

Further resolution of historical debates regarding Quantum Physics (2-slit experiment, entanglement, delayed choice etc.) can be found in [5], based on the Network Model of Physics. Perhaps Quantum Physics too, matured enough to claim the need for a paradigm change ...

1.1 The Scientific Revolution

It is similar to the 1900s Physics, when it went from "we only need to improve accuracy of computations / measurements" to the Relativity Theory and Quantum Physics revolution. Thomas Kuhn documented the structure of such "revolutions" in Science in general [24]. It follows some general teachings of Dialectics and Historical Materialism [25], which are somewhat "steined" by an association with politics ... yet one should take the "good points" and learn from them, when stepping back and evaluating the "old" and "new" in today's scientific literature.

1.2 Origin of Gravitational Interaction

The main topic of this article regards the quantum origin of Gravity, essentially included in the theory of nuclear force, spin dependent and why it is so weak: The Hierarchy Problem [26] [1].

[1] The mass problem related to Higgs boson [4], is not really a major issue; supersymmetry, Quantum Gravity (quantizing Space-Time) etc. are attempts ignoring the core of the problems in Quantum Physics. For an analysis of the HP in connection with Higgs boson, see [34].

In previews articles we explained how the quark field of baryons [2] unifies the four fundamental interactions of the SM, based on a more complex mathematical object, the Hopf fibration, 3rd quantization (Platonic / discrete groups of symmetry) and reinterpretation of the already existing Electro-Weak Theory and QCD.

Gravity is of quantum origin, spin-spin interaction dependent and already contained in the effective potential of Nuclear Force [1, 2]: its statistical average over random spin directions yields the weakness of Gravity, solving the Hierarchy Problem [26, 4].

GUTs approach to unifying fundamental interactions, limited to the Gauge Theory approach to Quantum Physics[3], needs replaced by a deeper understanding of the roles of the $U(1) \rightarrow SU(2)$ and $SU(3)$ groups of symmetry, part of the Hopf fibration model of quark states space.

Super-symmetry is the wrong way to unify fermions and bosons[4], as quantum particles (quanta); the natural solution is the Network Model [5] [5].

In this article we also address the induction phenomena of moving masses: from Electro-Gravity and Gravity Control, to Dynamic Gravity. We will justify Sarkadi experiments [16] from the above Theory of Gravity.

Additional support on the spin origin of gravity is provided by the work of Ning-Li.

2 Is there a Gravitational Induction?

2.1 Gravity from the Quark Model

See [29, 3] for an introduction.

In brief, Dynamic Nuclear Polarization (DNP or DNO) of nuclear spin affects the gravitational field and weight of masses of two interacting bodies, as proved by experiments on a probe under Earth attraction.

2.1.1 Following The Scientific Paradigm

As a historical example, we recall Tycho Brahe - Kepler - Newton development of the 1st scientific theory of Gravity. Observation of planetary motion provided the data, Kepler used it to verify his "effective theory" of Gravity; Newton created the general framework, i.e. Classical Mechanics (DE: $F = ma$ as a general Math-Physics model for Dynamics, and postulated the specific form for the G-interaction $F = km_1m_2/r^2$, as a constitutive law). Later, from the work of Laplace, Poisson etc. it became clear that this is a Mathematical paradigm for a central, conservative force with specified type of charges (positive only) and behavior (attractive).

Note that the field analog for a Mathematical Paradigm was given by Oerstead, Ampere, Faraday and Maxwell (from experiment, to intuitive model to precise Math model: curld and div analysis of motion, corresponding to conformal transformations of space, reformulated later in space-time by Lorentz, Minkowsky and justified intuitively by Einstein).

We will point to a modern, overlooked instance of such a paradigm, supporting the New Theory of Gravity with *data, experiment, theory and corresponding technology.*

2.1.2 UFOs and Gravity Control

A closer look of the evolution of the Theory of Gravity Control exhibits the same three stages: 1) observation of UFO travel, landing and take-off [20] [6]; 2) Alzofon's effective theory of gravitational potential analog to heat and temperature (same Laplace equation), verified by experiments using USAF

[2] Viewing quarks as its sources / sinks, i.e. a substructure of fundamental constituents of matter, the baryons, without assuming / modeling them as "particles".

[3] Notics how the Gauge Theory paradigm dominated the 20th century physics, to the point of being "recycled" for convenience, making almost impossible to think of an approach based on some enriched version of the theory, e.g. the Hopf fibration based Gauge Theory.

[4] See: above note.

[5] This unifies Feynman's approach via propagators for fermions and bosons of a QFT, by coupling the boson as a mediator, with the fermion, not only as a source / receiver, but also as a support for the interaction (source-receiver needs a transmission element!)

[6] Scientists from the physics community should acknowledge the reality of the phenomenon, which at this stage cannot fit within the traditional scientific method, which in their area of study involves the experiment as a crucial ingredient, hence appearing to the community as "pseudo-science"; of course, politics plays a major role regarding this topic.

measured data of UFO flight parameters; 3) Qualitative derivation of Gravity from quark model of the SM, consistent with the theory within Nuclear Physics (spin-spin dependence, effective potential etc. [1, 3]).

An analysis of how UFO behave in flight, landing and take-off, from the point of view of Gravity Control, was analyzed recently from the point of view of Gravity Control [13], with emphasis on application to space travel with present technology (already in use).

Should we be aware of such facts, phenomena, "external" to mainstream science? [23].

2.2 Nuclear Physics and Gravity

Hence the basis for controlling Gravity is DNO of nuclear spin [29], which controls the RGB quark directions, with their associated fractional electric charges as seen in electro-magnetic scattering experiments, revealing their long range component of the (total) nuclear force. The DNO was studied in Carson's book. Its application to Gravity control was pioneered by nuclear physicist Jams McCampbell [20].

As noted above, these sources and raw ideas were used by F. Alzofon to establish his effective theory of Gravity, and to setup the experiments that proved Gravity can be controlled (with USAF measured UFO parameters). The (only?) critic of his experiments [27] is much more superficial, biased by a lack of knowledge of the additional support provided by the present theory of Gravity, of quark structure origin. On the positive side, it provides pertinent questions to be answered and implicit demands for improving the experiments [28].

A further analysis of how accepted Nuclear Physics theory already points towards Gravity Control is available [3].

This static effect, due to a spin-spin correction term to the electric force, should have further consequences and observable effects under motion, linear and rotational.

2.3 Gravitational Induction

Gravity is not just attractive, since it is a correction of electrostatics, due to the 3D-quark structure of nucleons. Blowing up the point, beyond String Theory, as a 3D-sphere with a system of three sources / sinks, called the quark field, invites to rethink the quarks not as particles, with their own field and mutually interacting as in the SM, but rather as a whole, one field (the quark field). This also frees QCD from the task of confining quarks, and most likely, from its divergences and other problems.

It is hence natural to expect induction via currents represented by moving masses (G-charges): the complete spectrum of phenomena that we see in EM.

2.4 Sarkadi Dynamic Gravity Experiment

Let us consider a rotating mass separated by a pendulum by an isolating screen [16]. The initial experiment was performed by Laszlo Bodonyi, while the improved experiment was performed in 1998 by a team of researchers [30].

Measurements show a transfer of energy between the "primary" oscillating circuit (mass rotating) and "secondary" oscillating circuit, in a mini-analog of Marconi-Hertz experiment.

Now magnetism is due both to moving charges and electronic spin, while at a quantum level, the quark structure of nucleons is the origin of gravitational field.

Hence, in brief, electronic spin is associated to magnetism and nucleonic spin, with gravity.

How do these two effects relate to the above experiment?

2.5 Einstein-de Haas and Barnet Effect

The angular momentum - magnetic field coupling is demonstrated by Einstein - de Haas [9] (change in the magnetic field of a body causes the body to rotate) and Barnett experiments [10] ((a rotating body gets magnetized) [7]. The magnetic field of a probe is due to electronic spin, a consequence of the asymmetry of electronic orbitals [8]

[7] I remember reporting on this effect in our high school physics newsletter :)

[8] Furthermore, spin-orbit coupling of electron-nucleon with DNP allows to control Gravity [29].

This suggests that the observable effect in the above experiment may be due to this angular momentum - magnetic momentum coupling (An analog of the generalized linear momentum $P = mv + eA$ [31, 32]).

This generalized angular-magnetic momentum, in turn, may produce a generalized Lorentz force [33], which acts on moving and/or rotating charges, electric (electrons, ions etc.) or fractional (nucleons, as in the quark model).

2.5.1 Magnetic field and DNO

Generation of a magnetic field via rotation [10] could in principle affect the spin statistics of the nucleons, via EPR and spin-orbit coupling (DNO).

In the other direction, the Einstein-de Haas effect "The experimental observation and accurate measurement of the effect demonstrated that the phenomenon of magnetization is caused by the alignment (polarization) of the angular momenta of the electrons in the material along the axis of magnetization" [9].

Here again the electron spin - nuclear spin coupling could cause a an increase in the gravitational field of the body, as expected by the Theory of Gravity of quantum origin and Alzofon experiments.

This was also claimed by Sarkadi, and called *Dynamic Gravity* [16, 30].

But then Gravitational coupling between two such small bodies, in terms of number of nuclei, should be accordingly small. On the other hand recall that the micro-quantum gravity is a significant term of the effective potential of the nuclear force, and it becomes macrosopically very weak (would be insignificant here) under average over random spin directions.

This is analog to electromagnetism: electric polarization may change considerably the electric behavior of a probe; 2) magnetization, via an electric current in a coil, may change drastically the magnetic field of that probe.

What could be significant, is the change in weight of the two bodies, rotating and pendulum, due to the change in the gravitational interaction with Earth. This should affect the period of the pendulum.

2.5.2 Proposal of Modified Experiments

Nevertheless it prompts the modification of the experiment by including DNP (DNO): 1) of the rotating masses; 2) of the pendulum; 3) both, to see if the coupling is affected by the polarization of the nuclear spin, via the electronic - nuclear spin-orbit coupling.

The corresponding possible change in the weight / mass should be taken into account, according to the Alzofon's experiments.

The fact that electronic spin is affected at EPR level (Larmour frequency) may complicate the analysis. How this relates to Einstein-de Haas and Barnet effects needs documented.

Correlation with what happens with Faraday Disk, Searl Generator, Podkletnov experiment etc. should also be taken into account.

A better documented line of research is that of Dr. Ning-Li [36].

2.6 The need for a quantitative analysis

These qualitative analysis requires a precise model, using the known physics of the above effects, while then increasing the "resolution" of the model to include the Gravity potential interpretation of part of the Nuclear Force effective potential.

2.7 ... and Fine Structure Constant

This two effects depend on the corresponding permittivities, electric and magnetic $1/c^2 = \epsilon_0\mu_0$. Since $U(1)$-theory is coupled with $SU(2)$-theory, see [32] for the "quantum-connection" with $\hbar$. Note also that the fine structure constant (fundamental issue in Physics: Pauli, Feynman etc.) relates the fundamental electric charge q_E with the fundamental magnetic charge (as a source of magnetic vector potential), the fluxon g_M[37]: $\alpha = g_E/g_M$ [9]. For details in this direction see Abrikosov vortices [37][10].

[9] These are related ideas, like in a puzzle we need to put together ...

[10] The personal discussion at Argon Labs with the Nobel price winner was motivating for the author ...

3 Ning-Li's Research on Anti-Gravity

Another direction of study for obtaining additional gravitational fields, attractive or repulsive, uses supra-conductivity and rotation [10] to obtain alignment of spins of ions / nucleons: Podkletnov [35], Ning Li [36]etc.

The term anti-gravity is considered by many as a misnomer for controlling Gravity. But if Gravity is a force of electric type (asymmetric fractional charges of quarks, as sources / sinks), then the resulting spin-spin dependent correction term to electric force should have attractive and repulsive forms [11].

This section recalls a few facts and conclusions of Ning Li research on anti-gravity [36], supporting directly the spin-spin dependence of nuclear force theory, which is claimed to be Gravity of a quantum origin (quark structure of nucleons).

3.1 Research findings: "AC-Gravity"

Ning Li "claimed that an anti-gravity effect could be produced by rotating ions creating a gravitomagnetic field perpendicular to their spin axis. In her theory, if a large number of ions could be aligned, (in a Bose–Einstein condensate) the resulting effect would be a very strong gravitomagnetic field producing a strong repulsive force." (loc. cit.).

This alignment of spin directions is based on trapping superconductor ions in a lattice structure.

The difficulty of obtaining superconductivity is an impediment for performing the experiment in a "garage-lab", as Alzofon's experiment does not require an expensive equipment.

3.2 Interpretations

The explanation based on alignment of ions spin directions does not provide an underlying mechanism. Hence, the (probable) lack of knowledge of the quark model of the SM in Particle Physics prevented adding credibility to her theory and experiments.

In view of the new Theory of Gravity of quantum origin [29], Ning Li experiments come and further validate this theory and Alzofon's experiments. [12].

3.3 Taming Gravity

For the reader's convenience, we include a few illuminating statements from [38], regarding Li's research, findings and theory.

Rotating a high-temperature superconducting disk (HTSD) in supra-conductibility conditions has many properties attributed to Gravity (loc. cit.):

a) It is a "force-field machine that acts on all matter in a way that is similar to gravity". "But by exerting an attractive or repulsive force on all matter, it would be the functional equivalent of the impossible machine. ";

b) "Li predicted that if a time-varying magnetic field were applied to superconductor ions trapped in a lattice structure, the ions would absorb enormous amounts of energy. Confined in the lattice, the ions would begin to rapidly spin, causing each to create a minuscule gravitational field. ".

c) The reason ions spin align in a magnetic field is the Bose-Einstein condensate state; consequently: "In an HTSD, the tiny gravitational effect of each individual atom is multiplied by the billions of atoms in the disc. Using about one kilowatt of electricity, Li says, her device could potentially produce a force field that would effectively neutralize gravity above a 1-ft.-dia. region extending from the surface of the planet to outer space. "

We underline "tiny gravitational effect of each individual atom", to interpret later in terms of quark structure and corresponding Theoy of Gravity and Gravity Control.

d) "It does not modify gravity, rather it produces a gravity-like field that may be either attractive or repulsive."

[11] In fact this is the basis for space travel, as Solar / Galactic potential "sailing" [13]

[12] The fact that Ning Li left academia and pursued anti-gravity research as a private business, being awarded a half-million dollars grant from DOD, and that no results were made public (probably standard practice, though) invites to further validation of the relevance and success of her research.

Indeed, it does not modify Earth gravitational field notably (not even locally, maybe?), but changes the way the disk responds to it: think fractional charges are reoriented, like the sale of a sale-boat catching the wind (field lines of Earth's G-field) at different angles, after spin reorientation.

e) (loc. cit.) " "It adds to, or counteracts, or re-directs gravity," explains Larry Smalley, the former chairman of the University of Alabama at Huntsville (UAH) physics department."

For a visual of what the present author claims it happens, see [13], slides 53-54; this supports the previous claim.

f) Supporting the Hierarchy Problem explanation: "Li explains that as the ions spin they also create a gravito-electric field perpendicular to their spin axis. In nature, this field is unobserved because the ions are randomly arranged, thus causing their tiny gravito-electric fields to cancel out one another. In a Bose-Einstein condensate, where all ions behave as one, something very different occurs. "

g) Applications to space travel and shielding: " "It's a gravity-like force you can point in any direction," says Campbell. "It could be used in space to protect the international space station against impacts by small meteoroids and orbital debris." "

These are also claims of the present author, made independently from the Li's research work, findings and conclusions [13] [13].

3.4 The AC-Gravity Technology

The use of superconductibility to align spin orientations to achieve Gravity Control, using the properties of the Bose-Einstein condensate state, will be referred to as *AC-Gravity*, to honor Ning Li[14] and her research team's work.

This "simple" technology is well documented and tested, peer reviewed, U.S. DOD funded, ready for investors to bake (loc. cit.). The other "present day technology for Gravity Control" [8], based on the (too early, 1960-1994) Alzofon's work, is still in need for peer reviewing and grant funding.

Further accounts of this "More then one way to beat gravity" story, including highlights of Li's research, is reported in [39].

3.5 Further developments

The use of superconductivity *together* with DNO was suggested by the author in [13]. It is natural to try modifying the above super-conductivity based experiments on anti-gravity, including DNO (source of microwaves at Larmour frequency, to use EPR and nuclear spin re-orientation in a magnetic field via spin-orbit coupling).

The clear advantage is the pro-active pumping of energy to invert the population of spin oriented nucleons minimizing energy, and "generating weight" for the object, to obtain cancellation first, then anti-gravity (take off [13]).

Another line of research to produce "AG-hoover boards" (G-surfing) is to investigate quantum locking for various types of meta-materials (loc. cit.). The gravity analog of permanent magnets should exist, naturally (see anomalous gravity, Grebenikov beatles etc.) and man made (see Searl Generator for an G-analog of an electromagnet; cavorite [40] ... why not!? [23]).

4 Conclusions

We already have enough mind-provoking and motivating new ideas, theories and confirming experiments, to start the revolution predicted by Kuhn when facing such a deep crises in Physics.

4.1 The Hierarchy Problem

The Hierarchy Problem [26] is explained: macroscopic Gravity is in fact an average over spin directions of a spin dependent component of what is considered to be the Nuclear Force: electron-quark experiments demonstrate this aspect.

[13] The present author decided to look at Ning Li research when writing this article. Similarly, he reported on Gravity from quark structure origin under Platonic symmetry groups *before* being aware of Alzofon's work, via David Alzofon book on Gravity Control [8].

[14] Ning Li died at 79 y.o. in July 27, 2021.

Because of the random distribution of spins, this quark related correction term of the electric field (long range component which appears as a fractional charge of the three quarks in a baryon), is much smaller that the other terms of the effective potential of the chiral effective field theory model for the nuclear force. The meson model includes flavor-geometric aspects.

The hierarchy problem is also thought off as the issue with the UV sensitivity of the Higgs [34], §1.2.1, but in the author opinion there are too many "issues" to be solved first (what are quarks, redefining QCD, supersymmetry etc.) to take the SM/Cosmology connection as primary for this problem and study. Moreover, this avenue misses completely in the first place what Gravity really is.

4.2 Gravity Induction

The experiments of Bodoni, reproduced and documented by Sarkadi, suggest a dynamic Gravity effect (induction type), related with the Einstein de-Haas and Barnet effects. This allows to study the electronic-quark spin-orbit "projections" of the nuclear force.

Recall that nuclear force is an analog of van der Wall force in chemistry, a result of the contributions from meson bonds (pion, omega, sigma, rho), which includes flavor-geometry aspects, as well as quark-quark gluon interactions ($SU(2)$) which collectively is described by $SU(3)$ symmetry in color QCD; but this misses the flavor/geometrical aspects of discrete Platonic symmetry groups.

4.3 DNP vs. Supraconductivity approach to Gravity Control

Further experiments using superconductivity (low temperatures affecting the distribution of spins), instead of Dynamic Nuclear Polarization, were performed by Podlekov a.a., and Ning Li, demonstrating the production of strong fields similar to Gravity, yet attractive or repulsive, suggesting the connection with the electric force.

These experiments need be analyzed in light of the quark model of nucleons, and correlated with Alzofon's experiments by introducing a DNP component to the experiments.

On the theoretical side, the analysis of the Nuclear Force models should investigate the connection with Gravity.

4.4 Applications

In conclusion, observation, experiment and theory agree: Gravity is of quantum origin (elementary particle physics) and can be controlled. This triplet of stages of the scientific paradigm documents clearly the claim that alternative transportation methods can be implemented at industrial level with present technology.

This was claimed as early as 1981 by Frederick Alzofon [7], later documented by his son [8], demonstrated convincingly by Podkletnov and Ning Li's research (U.S. DOD grant and investor level).

Other researchers and teams currently investigating Gravity Control include Daniel Alzofon from Hathaway Research Int.[15], Mark Sokol from Falcon Space Labs, Russell Anderson from Spintronics [41] etc..

Further notable applications of quark spin control (nuclear force) concerns cold fusion and biological transmutations [18, 3].

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