A Note on the Standard Model

Lucian M. Ionescu

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Abstract

The four fundamental interactions of the SM can be unified as a *quark field* by using the Hopf fibration to model the basic building block of matter: qubit space (software viewpoint) / quark structure of the neutron (hardware). This approach uses a much richer mathematical structure in lieu of the GUT approach via a larger symmetry group and recycling the gauge theory paradigm, while still missing Gravity.

Quarks are not independent particles. The unified field is the quark field, a type $(2,1)$ vector field associated with neutrons, breaking the $SO(3)$-symmetry of classical or quantum pointwise charges. Under interactions with the environment it decays into the constituents of the stable form, the hydrogen atom.

Weak interaction is not a force, rather a transition between modes of vibration of baryons. Strong Force needs to be redesigned as a nuclear force, instead of being tailored to confine quarks.

Gravity is a correction to EM as the main long range component of the quark field. Motion adds dynamical aspects to Gravity, including induction due to mass currents, which has been experimentally proved.

Applications to Gravity Control, experimentally verified, and controlling Cold Fusion / Transmutations, also experimentally observed, are briefly mentioned.

1 Introduction

The Standard Model is built around three fundamental interactions, with Gravity a fourth one, yet considered too weak to affect the SM and left to other approaches, which understandably disregard the quantum structure of matter: Newton's Theory and Einstein's General Relativity.

The emergence of these theories explains why the above four interactions are considered fundamental, hence independent so far: they have been studied separately, corresponding to quite different experimental setups or through observation (planetary motion, Cosmology etc.).

In this note the author recalls the history of the quark model and emergence of the fundamental interactions, and provides arguments that the weak force is not a force in any natural way, hence should not be modeled as a gauge interaction, QCD is not necessary as it is currently formulated, since quarks are not particles, and that Gravity results from the unified quark field, as a correction of the EM field of an equivalent pointwise charge, due to the three "fractional" charges of baryons.

Although it is an expository article, focusing on the ideas in physics, it aims to provide insight into the key points that need to be addressed in order to "reassamble" the SM as a unified theory of fundamental physics.

The basic "updates" are: 1) 3rd quantization: postulating discrete symmetry groups, quantizing the qubit space itself; 2) the quark field of baryons, modeling the ensemble of the three fractional charges of the three quarks in baryons as the signature of one unified field with lines of force of type $(2,1)$ or $(1,2)$[1].

Among the remarkable consequences are: 1) Gravity is the result of breaking the isotropy of the pointwise charges, modeled by the quark field, and introducing a correction term to the long range component that is Electric field; 2) Gravity is not a fundamental force and can be controlled, even redirected towards other masses to obtain apparent "anti-gravity" at the surface of the Earth, for transportation purposes [4]; 3) Nuclear force is also quark spin direction dependent for similar reasons,

[1] The fundamental role of quark field of a baryon in Quantum Physics and Quantum Computing can be compared with the fundamental role of a transistor in VLSI chips of processors in classical computers; the analogy goes much beyond this, towards comparing their functionality.

enabling high mass stable alotropic forms of chemical isotopes via a catalytic approach to cold fusion, as well as in biological transmutation.

2 The Fundamental Interactions

The standard model uses gauge theory model for EM, weak force and QCD, with gauge groups $U(1) \times SU(2) \times SU(3)$[2].

In the 50's Gell-Mann introduced the idea of quarks as free particles, constituents of baryons and mesons. This idea was finally accepted because of the effectiveness of the representation theory of $SU(3)$ to explain the classification of elementary particles, and prediction of a new elementary particle Ω^{++}.

Then, QCD was needed and invented in order to keep quarks confined. The impossibility of separating quarks is proof of the fact that a baryon is an irreducible quantum system, not composed of "elementary particles".

2.1 From Points to Strings and beyond: Bloch Sphere

At that time physicists opposed the idea of quarks as free particles; the concept of particle was obsolete with the advent of QM and particle-wave duality. Heisenberg's Matrix Mechanics and S-matrix approach to model scattering experiments were a precursor of Quantum Computing, yet with complex numbers not yet with qubits.

Moreover, various experiments point towards the inadequacy of particle-wave duality: 2-slit experiments, Aharonov-Bohm effect, delayed choice and quantum erasure.

The idea of strings blowing-up the point to a circle looked promising, with Feynman graphs and CFT's punctured Riemann surfaces clearly showing the role of networks in description of quantum phenomena. The later use of qubits, topologically a 3D-sphere, seamed a natural step forward, from strings S^1 to balls S^3 (parallelizable spheres).

Taking into account all this it is clear that the modern physics is that of quantum networks quantum information processing.

Hence, the quark model of SM has to be rewritten in light of Quantum Computing: the 3 quarks of a baryon (matter / nodes of the network) are but a 3D-frame, with colors RGB for quark states as labels of a local space, to be "assambled" into a network via channels of quantum information: fermionic channels for $U(1)$-interaction (open versions of the closed orbitals in atoms) and mesonic channels for $U(2)$-interactions changing the local Klein geometry defined by the binary / Platonic symmetry groups. These corresponding to the 3 generations of fermions, with dual geometries corresponding to primary quark flavors.

2.2 On the Weak Force

The geometric model of a 3D-frame is described by $SU(3)$-rep theory and quark flavors (Platonic / binary 3D-point groups). The states are subject to transitions which corresponds to an exchange of mesons with naw are represented as quark line diagrams, exchanging the various quark flavors.

Hence, recycling gauge theory to model such transitions via a weak force is not adequate, and misleading.

2.3 On the Strong Force

In order to confine quarks in a baryon, QCD was formulated as a Yang-Mills Theory coupled with fermionic fields of quarks as independent particles, leading to its divergences, mainly due to self-interactions within a baryon.

[2]If Gravity is a fundamental force, who will study it as such? GR only models Gravity as an effective theory, using deformation of the metric approach.

2.4 Just One Force Field

In conclusion, the three gauge groups were introduced separately, and should not be kept as such, part of a larger group of symmetry, as in GUTs, but rather unified using a unifying math structure:

$$Hopf\ fibration: \quad U(1) \to SU(2) \to S^2, \qquad Z/n \to \Gamma \to \ Platonic\ Solid.$$

This corresponds to the qubit at the level of quantum logic and Quantum Computing, and also to the idea that each "pixel" of matter has a space frame and a clock; an extension of Einstein's synchronization analysis to define time, to space, via gauge interactions correlate these local models yielding the global macroscopic Space-Time. But then time is not an independent dimension as in block-model of the Universe, but rather an internal one, associated with the quantum phase (Feynman $e^{i\omega t}$: quantum phase as a "clock" carried by a particle).

2.5 The Role of Neutrino

The neutron is the basic constituent on matter, with maximal symmetry, yet with a quark field not $SO(3)$ invariant. Under beta decay it splits the qubit model $H = C \times C$, conceptually into a local Space-Time structure: proton ($SU(3)$ 3D-quark frame) and orbitals ($U(1)$-periodic structure).

The neutrino postulated by Pauli in the Point-Form of Quantum Mechanics to accommodate the conservation of momenta, is no longer needed in the S^2-quark model. The persistence in detecting and making sense of the elusive neutrino is due to ignoring that the particle concept is by now obsolete in Quantum Physics. It of course serves some well established theories, especially with applications to Cosmology.

Its role in Elementary Particle Physics is rather reflecting the break of symmetry and transitions governed by symmetry groups. There is a strong hint that it is rather associated to spin direction phenomena, such as Gravity (substitute for graviton) [3]. In view of Noether's Theorems, how the change of symmetry group reflects in conservation laws, requiring a generalized concept of energy-momentum related to information, remains to be studied.

Note also that particle physics systematically ignores "elements of reality" such as quantum channels (2-slit experiment, fermionic "open orbitals", idea of ether etc.) which recently were experimentally observed in Quantum Computers, being interpreted as wormholes / Einstein-Rosenberg bridges, responsible for entanglement (ER=EPR).

Such a wealth of quantum structure needs to be considered, revisiting the idea of a neutrino carrying the "missing momentum-energy", for instance in beta decays.

3 Quantum Gravity

It is said that Gravity is too weak to be studied in Elementary Particle Physics, within the Standard Model. But the mere fact that it exists shows a major omission of the SM.

The fractional charges of quarks are sources and sinks, modeling a quark field with such an index, structure emanating from a baryon, without the assumption of the usual singularity of a pointwise charge.

This leads to a field that is not isotropic, breaking the usual $SO(3)$ (or $SU(2)$) symmetry. It is claimed that the long range is EM and a correction term, spin direction depending, accounting for Gravity.

3.1 EM and Gravity

The long range of the quark field is EM together with a contribution spin direction dependent corresponding to the orientation of the fractional charges of a baryon (quark field orientation), which yields Gravity; a much stronger component in individual interactions between pairs of baryons, which averages to a very weak effective interaction due to chaotic orientation of spin directions of the 3D-frames of quarks. The gravitational constant should be computable from the stronger G-force under a Boltzmann distribution of energetic states controlling the statistics.

This is similar to magnetism and magnetic permitivity, and that we can control the strength of magnetic field of a magnet using e-currents, by reorienting electron's spin directions.

A similar phenomenon regards nucleus and DNO can reorient the nuclear spins controlling the G-force.

3.2 Quantum Gravity and GR

Furthermore, the recent interpretation of teleportation of qubits in a quantum computer exhibits key properties of a gravitational wormhole, yet being sufficiently small to implement on today's quantum hardware. In this way a conceptual bridge is established between quantum physics and GR, allowing to consider Quantum Gravity in the framework of GR. Note that this conceptual model of Quantum Gravity does not reflect the capabilities of controlling it, which needs an insight into the quark model of elementary particle physics. Nevertheless it has a historical value and will be a transitional model until spin will be accounted for, as in Modified Theories of Gravity [9].

4 Nuclear Force

First the Electroweak Theory can be rewritten implementing the discrete Platonic groups of symmetry, i.e. 3rd quantization. next, the weak force can be replaced by a formalism on quark lines diagrams based on representation theory. The main point is to consider the three quarks of a baryon as a 3D-frame of "local space", with local directions. R, G, B. The gauge connection will be formulated on the frame bundle over a diagram. Transitions involving changes of quark flavors, corresponding to the three Platonic dual pairs of geometries are implemented algebraically (Res and Ind functors). The symmetry group controlling such transitions is $SU(3)$ as a symmetry group of a basis of $SU(2)$, with $U(1)$ isoclinically embedded, corresponding to the Hopf fibration (S^2 as a homogeneous space).

The inter-baryons interaction will exhibit a short range force due to $SU(2)$, and gluons as exchange bosons between pairs of quarks of different baryons involved (no self-interaction, at the level of the same baryon: no need for confinement, since quarks are not independent "particles").

The change of geometry, presently modeled by an exchange of quark flavors, is mediated by mesons and can be represented at the level of representation theory of the finite subgroups of $SU(3)$ as a group of symmetry of basis of $SU(2)$ and its finite subgroups. Recall that the three generations of fermions correspond to Platonic symmetry groups (Weyl groups of $E6-E8$) with their dual geometries: tetrahedral (self-dual), cubic-octahedral and icosahedral-dodecahedral (see Dr. Moon's model below for the nucleus of chemical elements).

4.1 Relation with Dr. Moon's Model

The *nuclear force* depends on the discrete Platonic groups, and the phenomenology of the periodic Table of Elements reflects this, conform the work of Dr. Robert Moon [10]. His expertise on nuclear physics lead him to an early and incipient observation of the role of Platonic symmetry in the structure of nucleus, with occupation of the nodes similar to the theory of occupation of electronic levels in atoms, including the stability of chemical elements.

It is an incipient model for the structure and properties of the nucleus, in a similar way Bohr's model for the atom was [3]

A corroboration with the other models and data [11] would be beneficial for both approaches.

4.2 Relation with Cold Fusion

Spin orientation also affects the short range nuclear force, which can be used as a catalytic effect in cold fusion. Conjecturally, one isotop can have various discrete arrangements of nuclei, depending on the specifics of the cold fusion process; consequently we expect that lifetime of isotops will vary for these alotropic forms of isotops, providing stable chemical elements with high mass.

The use of DNO affecting the fusion / transmutation process may be the key to understand transmutation in living systems, which has been well documented yet ignored by mainstream science [14, 13].

[3] It is interesting that Kepler attempted to use Platonic groups to model the planetary motion; Bohr's model uses discrete $Z/n \to U(1)$ in some sense and Moon's model uses $\Gamma \to SU(2)$.

4.3 Baryon States and Elementary Particles

The higher states of nucleons form an analog of 3D-cymatics on Platonic Solids corresponding to the discrete subgroups of $SU(2)$. This involves vibrations described by Z/n on faces, an analog of Bohr's planetary model of the atom (or Somerfeld's - quatization rules etc.). The change of geometry due to change of flavors of quarks (Platonic Geometry a la Klein) yield "other" elementary particles (baryons: see classification).

The role of finite gauge groups mentioned, Platonic and binary, are well documented in [6], in connection with the CKM and PMNS matrices. That in this author opinion, Gravity can be included in the SM confirms the general idea regarding the Theory of Gravity from a quantum origin, at the level of elementary particle physics.

4.4 Dynamic Gravity

Dynamic effects of Gravity are also studied by other researchers, e.g. Desko Sarkadi [7], who acknowledges a strong gravitational force related to nuclear force, compatible with our theory derived from the quark model.

Note that, as explained elsewhere, GR uses deformation of the metric via Ricci tensor as a precursor of the concept of propagator in QFT. Hence QFT is a generalization of the main idea in GR, a discretized and quantized approach: no need to "unify" GR and QFT.

As byproducts of "Static Gravity" (controlling spin direction of quarks) and Dynamic Gravity (mass currents), these additional sources for Gravity explain the cosmological data in conflict with what GR predicts based on the observed masses, without dark matter and dark energy [9].

5 Relations with GUTs and TOEs

GUTs approach via a larger gauge group omits to recognise the emergence of the four fundamental interactions independently, as well as their quite different roles: weak interaction responsible of transitions of states due to different symmetry groups (Platonic), QCD's role to confine quarks, that are not really independent particles, and omitting Gravity from the picture as being too weak, to be left in its classical form (Newton / Einstein).

What SM needs is a reinterpretation of what quarks are and the role of $SU(3)$, looking for a correction responsible for Gravity: the 3-quarks as surces/sinks of the unified field of a nucleon as a complex indivisible system. The neutron is maximal symmetry, unstable higher energy level of a qubit space ($C \oplus C$ representation of $SU(2)$ as a $U(1)$ Hopf fibration), which "splits" under interactions with the environment into a hydrogen atom as a model of local Space-Time (3D-quark frame and electronic "clock").

TOEs recognises the role of exceptional Lie algebras E6-E8, which in fact correspond to Weyl groups, none other then binary 3D-point groups, double of Platonic symmetry groups.

These Lie algebras model paths under multiple reflections in Weyl chambers in 3D-kaleidoscopes, as higher analogues of beam splitters [12]. An optical quantum computer with such 3D-kaleidoscopes conjecturally can model our 3D Universe with an analog of ray tracing algorithms, reminiscent of Feynman paths.

6 Conclusions and Further Developments

In conclusion SM captures the experimental data into an open theory that needs be re-structured conceptually, based on Quantum Computing as a fundamental language of quantum physics together with 3rd quantization that discretizes "everything", including the qubit space of quantum computing and gauge group of SM [6].

The separate "fundamental" interactions are faces of just one interaction when considering the neutron as an irreducible yet complex quantum system modeled via the Hopf fibration.

The progression point-string-qubit ($S^0 \to S^1 \to S^3$) is natural, in view of the above, and invites to consider quark structure of baryons as modeling the unified field: the quark field. This is not isotropic and does not have a singularity; rather it acts like a "pump" of EG-nuclear lines of force.

The long range component constitute EM with a correction term spin direction dependent that yields Gravity under a statistics averaging process. Nuclear force has Platonic symmetry explaining the build-up of nuclei in the Table of Chemical Elements, including their stability (Moon's Model).

Gravity can be controlled and under motion of masses exhibits induction phenomena, similar to magnetism; the later is due to electron's spin (and motion: Lorentz transformations), while the former is due to nuclei spin (quark spins directions, corresponding to the orientation of the three fractional electric charges, when probed by electrons, as sources / sinks of the quark field).

Electric repulsion in nuclei can be controlled, with the nuclear force dominant, making possible cold fusion in biological systems, e.g. via the catalytic effect of enzymes.

The presentation in this article summarises key points of a new paradigm in physics, which are documented in some of the previous articles of the present author [15, 16, 17].

The reader is invited to take one key point at a time and apply it to many of the "mysteries" of quantum physics, e.g. the double slit experiment! See also [18] for further questions which can be answered in the present framework.

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