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“Quantum Polyhedronic Concept of Gauge Particles and Gauge Fields in Correlations with Lepton–neutrino Particles Incorporated in Standard Model (SM)”

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Abstract: This an expert text is focused on still unknown questions and answers of physics of elementary particles, elementary fields and its entangled particles.

The text is built on new concept of theory of elementary particles in Standard Model, namely interactions of gauge bosons, hypothetically neutrinic gaugino – between lepton–neutrino and w (boson) wion and Z boson zion, and among vector bosons and scalar bosons, Higgs boson or graviton, gravitino and photino.

Quantum theoretical particle Polyhedronic quantum prisma is possibly called Quantum Polyhedronic Soliton, and may lead to new point of view on TWISTOR THEORY, SUPERTWISTORS, TWISTOR STRING THEORY, GAUGE THEORY.

Ending part of this text is dedicated to a Model situation of quantum gravity tunneling and entanglement of graviton and gravitinos.

In this text is re–discovered scientifical work of scientists like Sir Roger Penrose, Cornelius Lanczos, Alan Faber, Kenneth G. Wilson, Alexander Polyakov.

Keywords: elementary particles and fields, entangled particles, Standard Model, lepton neutrino–gauge bosons particles, gravitino, photino, twistors string theory, supertwistors.

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1. Highlights

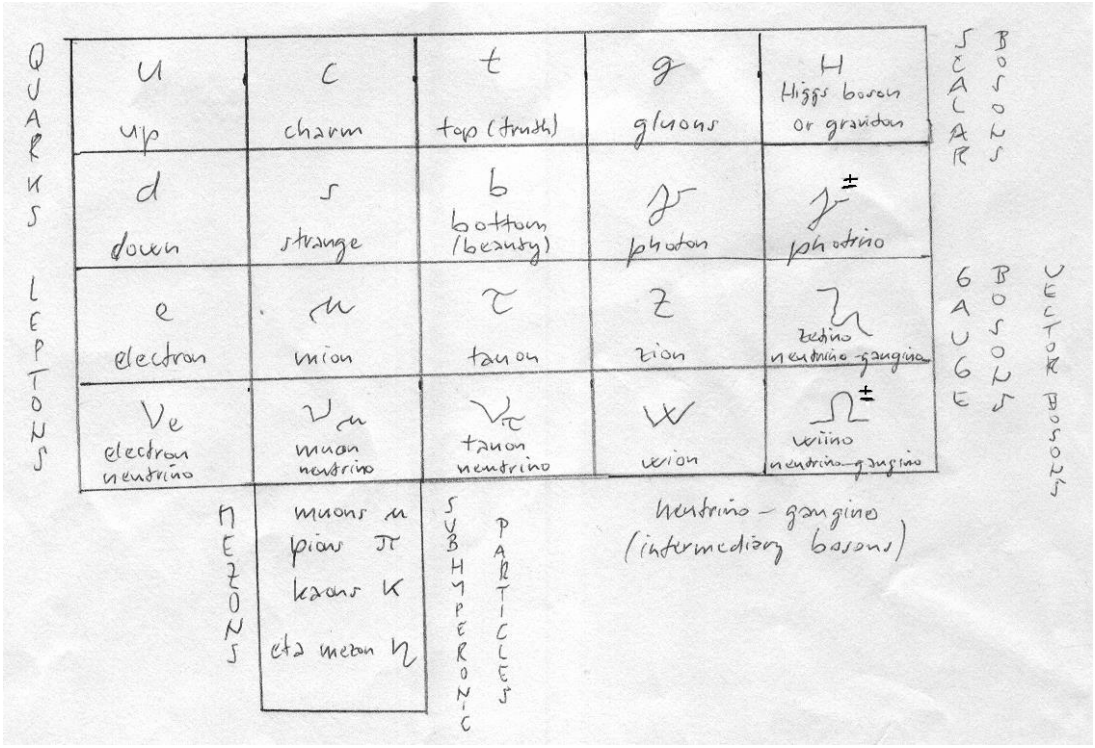

Fig. 1. New Concept of Standard Model of Elementary Subatomic Particles, Sketch of Author: Mgr. I. Krištof.

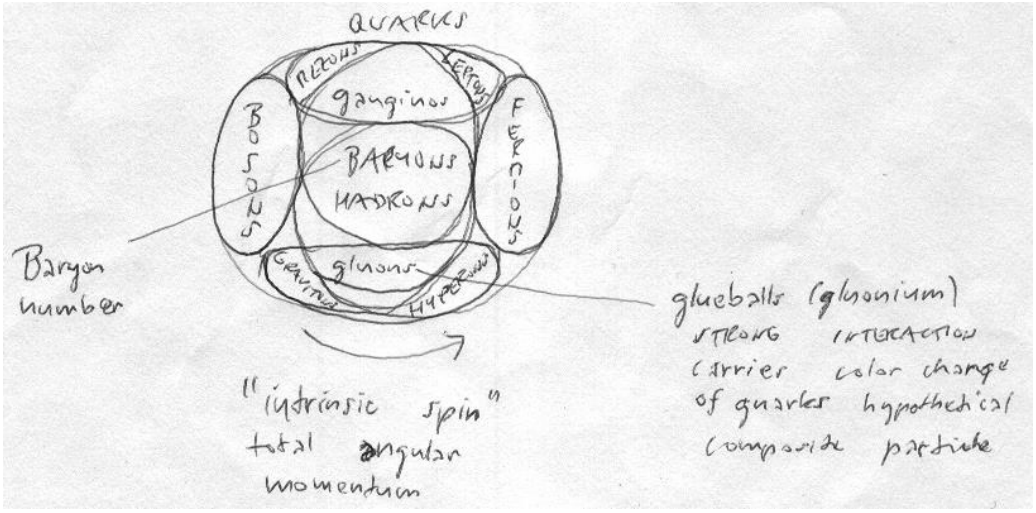

Fig. 2. Theoretical Concept of nature's interactions of gravity and supergravity (quantum gravity – loop gravity interaction). Strong nuclear interaction, weak nuclear interaction and electromagnetic (photonic) interaction, Sketch of Author: Mgr. I. Krištof.

2. Introduction Theory and Methods

Twistor Theory proposed by Sir Roger Penrose in 1967 like a possible path to a quantum gravity theory. In twistor theory, Penrose transforms maps of Minkowski Space into twistor space, taking

the geometric objects from a L–dimensional space with a Hermitian form of signature (2.2) to geometric objects in twistor–space, specified by complex coordinates, called twistors.

B–model string theory in twistor space an amplituhedron N=4 supersymmetric → Yang–Mills Theory → MATHEMATICAL SPACE KNOWN AS THE POSITIVE GRASSMANNIAN.

Example 4D complex of Ricci tensor and Weyl spinor representation, called Weyl–Lanczos equations.

Comment 1: Lanczos tensor (or potential) is a rank of 3 tensors – Newman – Penrose general relativity formulation that generates the Weyl tensors.

SUPERTWISTORS – are a supersymmetric extension of twistors introduced by Alan FABER in 1978. Along with the standards twistor degrees of freedom, a supertwistor contains N fermionic scalars, where N is the number of supersymmetries.
On Supertwistor Space can be realized on SUPER CONFORMAL ALGEBRA.

TWISTOR STRING THEORY – in gauge theory, a WILSON LOOP (FARADAY'S "FLUX TUBES" QUANTUM OF ELECTRO–MAGNETIC FIELD).
Named after Kenneth G. WILSON BONA FIDE OPERATORS ON FOCK SPACES is a gauge-invariant observable obtained from the holonomy of the gauge connection around a given loop (gauge transformation).

Comment 2: ALEXANDER POLYAKOV formulated the first string theories, which described using of an elementary quantum loop in propagation spacetime, spin, spinors, spin networks, spinforms.

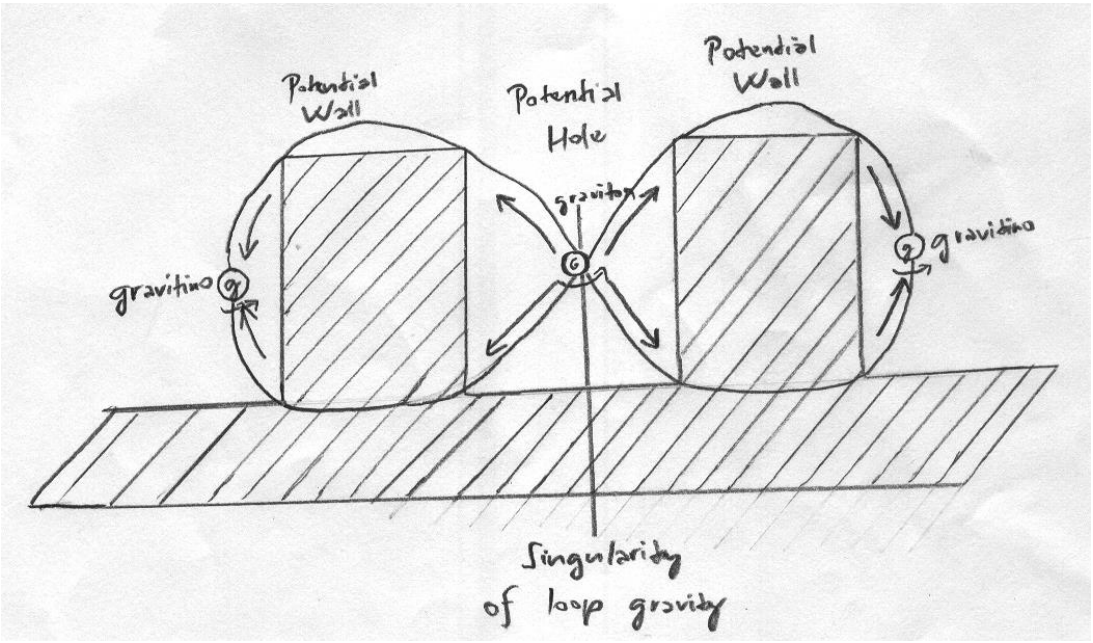

Fig. 3. The Model situation of quantum gravity tunneling and interaction between graviton and gravitinos. According Author: Mgr. I. Krištof.

- **Comment 3:** Cornelius Lanczos
  (2.2.1893 Székesfehérvár, Hungary –
  25.6.1974 Budapest, Hungary)
  Jewish Hungarian mathematician, was born Kornél Löwy.

Alan Faber
An Approach to gravitational radiation by a method of spin (tetrad or spinor formalism) dual model with supergravity.
Alexander M. Polyakov
(*27.9.1945 Moscow, Russia)
Russian theoretical physicist, working in Landau Institute in Moscow.
Gauge fields and strings / later in Princeton Advanced Studies University.
Kenneth G. Wilson
(8.6.1936 Walthem, Massachusets, U.S.A. – 15.6.2013 Saco, Maine, U.S.A.)
An American theoretical physicist. Pioneer in leveraging Computers for studying particle physics, awarded the 1982 Nobel Prize in Physics, for his work on phase transistors.
His fundamental work on the renormalization group WILSON LOOPS (gauge fields and strings)

- non–Abelian Wilson line:

$$\Psi(c) = Pe^{\int_C A} \quad \text{(Eq. 1)}$$

Non Abelian gauge theory based on the symmetry.

- two curves C and C':

$$\partial\Sigma = C' - C \quad \text{(Eq. 2)}$$

$$\delta\Psi(C) \coloneqq \Psi(C') - \Psi(C) = P\left(e^{\int_C A}\delta\int_C\right) \triangleq P\left(e^{\int_C A}\iint_\Sigma F\right) \quad \text{(Eq. 3)}$$

Curve C, P – path ordering.
The path used in the Wilson line is the eikonal path taken by the parton that emits or absorbs the soft gluons (QCD).

- Stoke's circulation theorem:

$$\delta\int_C A \coloneqq \int_{C'} A - \int_C A = \oint_{\partial\Sigma} A = \iint_\Sigma F \quad \text{(Eq. 4)}$$

Fig. 4. Some important classes of loops. A smooth, a cusped, and a cusped crossed loop (Sketch of Author: Mgr. I. Krištof).

3. Conclusions

Theory of Elementary Subatomic Particles is nowdays known like Physics Beyond Standard Model, first who worked on Solar Standard Model was an American physicist Raymond Davis (60's and 70's) and American chemist John Bahcall, on Standard Model worked also Gell-Mann Murray, the first steps towards the SM was Sheldon Glashow's, Steven Weinberg and Abdus Salam. To nowdays Particle Physics developed in technical level of mankind, LHC, Fermilab, BNL, STANFORD LINEAR ACCELERATOR, ACCELERATOR AND COSMOTRON, BEVATRON, CYCLOTRONS LEAD NEW WAY TO SEE ON MODERN PHYSICS.

Remember the Higgs Boson in 2013, Nobel Prize in Physics, in public it was called miracle particle for modern physics is significal Higgs–mechanism.

Physics of High Energy particles is waiting for new miracles each day in CERN, DUBNA, FERMILAB.

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