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Implication of Nonlinear-Supersymmetric General Relativity(NLSGR)

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Considering (unstable) Riemann space-time whose tangent space possesses NL SUSY structure specified by the Grassmann coordinates ψα for SL(2,C) and the ordinary Minkowski coordinates xa for SO(1,3). we can construct the unified vier bein ˜ eaμ which enables the ordinary geometric argument of the general relativity(GR) principle and obtain straightforwardly a new Einstein-Hilbert(EH)-type NLSUSY invariant action LNLSGR = |˜ e|(R(˜ e) + Λ) (Nonlinear-supersymmetric general rela tivity theory(NLSGR)) equipped with the cosmological term Λ and the promising gauge symmetries.
Due to the NLSUSY structure of space-time LNLSGR would breaks down (called Big Collapse) spontaneously to ordinary EH action of graviton eaμ, NLSUSY action of Nambu-Goldstone(NG) fermion ψi,i = 1.2,..,N (called superon) and their grav itational interaction called superon-graviton action LSGM(e,ψ).
Simultaneously the universal attractive force graviton would dictate the evolution (vacuum) of LSGM by producing all possible gravitational-composites of superons which correspond to the (massless) eigenstates of the linear SUSY(LSUSY) SO(N) super-Poincar´e(sP) algebra of space-time symmetry, which can be regarded as the ignition of the Big Bang (model) of the universe and gives a new paradigm for the supersymmetric unification of space-time and matter.
By the linearization of NLSUSY we show in the toy model that the ordinary linear SUSY(LSUSY) model for the low energy particle physics can emerge in the vacuum of LNLSGR/SGM„ where all particles are the (massless) superon-composite eigenstates of LSUSY super Poincar´ e algebra.
NLSGR/ SGM paradigm can bridge naturally the cosmology and the low energy particle physics, which provides new insights into unsolved problems of cosmology, particle physics and mysterious relations between them, e.g. the space-time dimen sion four, the origin of mass and SUSY breaking, the dark energy and the dark matter, the dark energy density≈ (neutrino mass)4, the tiny neutrino mass, the three-generations structure of quarks and leptons, the rapid expansion of space time, the magnitude of the bare gauge coupling constant, matter dominance , the shape of black hole etc.
Many open problems are discussed. All results are published separately. For more details:

1. K. Shima, Invited talk at International Conference , 100 Years Werner Heisen berg- Works and Impact-, September 26-30, 2021., Bamberg, Germany. Proceed ings: Fortschr. Phys 50(2002) 5-7. 517-523, eds. D. Papenfuss, D. Luest and W. P. Schuleich.
2. K. Shima, Invited talk at Conference on Cosmology, Gravitational Waves and Particles ,2017, NTU, Singapore (Uploaded at YouTube by IAS). Proceedings of CCGWP, ed. Harald Fritzsch, (World Scientific, Singapore, 20

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