Hypersymmetry as a New Paradigm in Contemporary Physical World-View

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Short abstract: The prevailing paradigm in post-SM physics is supersymmetry (SUSY) and its varied versions. Limits of the SM, and expected GUT, demanded to elaborate a New Physics (NP). The most promising model for a NP was SUSY, based on string theory, until experiments failed to demonstrate supersymmetric particles. Alternative theories have been revalorised and have got actuality again. Hypersymmetry (HySy) provides an alternative. One of the alternatives of SUSY particles is the set of isotopic field-charges (IFC) and bosons mediating between the IFC siblings. Isotopic field-charges have a conserved property, called isotopic field-charge spin (IFCS). Conservation of the IFCS is ensured by the group of Hypersymmetry (HySy). HySy is broken at lower energies. The paper sketches a picture of physical interactions provided by HySy.

Extended abstract: The Standard Model (SM) painted an apparently round picture of the physical interactions. Similar to the Newtonian physics in the 1890s, limits of the SM presented themselves in the 1990s. These limits revealed themselves just at those high energies, where the expected unification theory (GUT) of all interactions could be realised. The demand for a New Physics (NP) beyond the SM has got formulated in the late 1990s. G. 't Hooft [2005] wrote on the features of a NP: "What is generally expected is either a new symmetry principle or possibly a new regime with an altogether different set of physical fields."

String theories (1980s) offered the mathematical opportunity for the supersymmetric (SUSY) model (early 1990s) that proved to be a reasonable theory, promising to meet the expectations for a NP for long.

There appeared many alternatives of SUSY. Most of them were based also on string theories. Much money and work have been invested to demonstrate predicted SUSY particles, and much less in testing alternatives. The strong belief in the success of SUSY was emphasised by calling alternative particles detractingly "exotic" ones.

In 2017, these beliefs weakened when search for the simplified SUSY model, which was reduced to 5 (according to other sources, 4) free parameters, has aborted. Experiments have not confirmed it. The extended MSSM (minimal supersymmetric standard model) includes 124 (according to other sources, 104) free parameters, what seems to be too complex. There is still hunt for such MSSM SUSY particles, but its reality seems low, being inconsistent with the simplicity principle.

Alternative theories have been revalorised.

The hypersymmetric (HySy) theory (2001-) is an alternative to SUSY that is based on hypotheses different from string theory. The HySy model met both requirements formulated by 't Hooft in 2005; even more. SUSY (and most its alternatives) became on-and-on more complicated during time. Now, HySy offers the simplest NP model: HySy involves the least number of free parameters among the alternatives.

HySy is based on the set of isotopic field-charges (IFC) and bosons mediating between IFC siblings. IFC are such pairs like gravitational and inertial masses, Coulomb- and Lorentz-type electric charges. The members of these isotopic field-charge pairs (sources of the respected fields) are subject of different transformation rules by increase of velocity. One should distinguish them, at least at high energies. In 2004, there was analytically proven that the members of such field-source siblings can be transformed into each other and this transformation takes place in a velocity dependent gauge-field. Moreover, they have a conserved property that switches between two stable states during the transformation. On analogy, this conserved property was called Isotopic Field-Charge Spin (IFCS). Since their transformation and conservation law is independent of the Lagrangian characterising the given interaction, we have good reason to assume that similar field-source siblings appear in the weak and strong interactions as well. Due to the velocity-dependent gauge-field, HySy is broken at lower energies.

The algebra and group of HySy (IFCS conservation) were found in 2014. Sticking to all that field theory states on conserved quantities, one must assume the existence of a mediating boson in this gauge field. In order to demonstrate the reality of HySy, one needs to find these bosons (1 for the electromagnetic, 3 for the weak, 8 for the strong, and hopefully 1 for the gravitational interaction), as siblings of the SM bosons.

HySy provides a model where two bosons are exchanged in an interaction; and there appear fermion-fermion and boson-boson pairs in contrast to the picture of SUSY. HySy is a special class of symmetries that fits in the intellectual heritage of J-P. Vigier, whom I referred to already in my MS thesis written on symmetries in physics 1970-71. The paper will sketch a picture of physical interactions provided by HySy.

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