Braun K., preview homepage text, part (B)

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(B) A Hilbert space based quantum gravity model

The Einstein field equations are classical non-linear, hyperbolic PDEs defined on differentable manifolds (i.e. based on a metric space framework) coming along with the concepts of „affine connexion“ and „external product“.

The Standard Model of Elementary Particles (SMEP) is basically about a sum of three Langragian equations, one equation, each for the considered three „Nature forces“.

Quantum mechanics is basically about matter fields described in a L(2) Hilbert space framework modelling quantum states (position and momentum).

Our proposed quantum gravity model is based on a properly extended pair of distributional (truly geometrical) Hilbert spaces, which for example avoids the Dirac „function“ concept (to model „point“ charges) with its underlying space dimension depending regularity.

The aligned modelling framework between quantum theory and classical field theory requires some goodbyes from current postulates of both theories. The central changes are :

- as the L(2) Hilbert space is reflexive, the current considered matter equations can be equivalently represented as variational equations with respect to the L(2) inner product; this representation is extended to a newly proposed quantum element Hilbert space H(-1/2); we note that the Dirac function is only (at most, depending from the space dimension) an element of H(-1/2-e), and that the main gap of Dirac‘s related quantum theory of radiation is the small term representing the coupling energy of the atom and the radiation field.

- classical PDE equations are represented as variational equations in the H(-1/2) Hilbert space framework coming along with reduced regularity requirements to the correspondingly defined solutions; we note that the Einstein field equations and the wave equation are hyperbolic PDEs and that PDEs are only well defined in combination with approproiate initial and boundary value functions; we further note, that the main gap of the Einstein field equations is, that it does not fulfill Leibniz's requirement, that "there is no space, where no matter exists"; the GRT field equations provide also solutions for a vaccuum, i.e. the concept of "space-time" does not vanishes in a matter-free universe. At the same point in time H. Weyl's requirement concerning a truly infinitesimal geometry are fulfilled as well, because ... "… a truly infinitesimal geometry (wahrhafte Nahegeometrie) … should know a transfer principle for length measurements between infinitely close points only ...", (WeH0).

The proposed model is about truly fermions resp. bosons (i.e. quantum elements with and without kinematical energy, i.e. mass), governed by their corresponding kinematical and potential energy Hilbert spaces, modelled as decomposition of H(1/2) into the sum of the kinematical energy space H(1) and its complementary sub-space with respct to the norm of the overall energy Hilbert space H(1/2).

The proposed model

- overcomes the main gap of Dirac's quantum theory of radiation, i.e. the small term representing the coupling energy of the atom and the radiation field, becomes part of the H(1)-complementary (truly bosons) sub-space of the overall energy Hilbert space H(1/2)

- acknowledge the primacy of micro quantum world against the macro (classical field) cosmology world, where the Mach principle governs the gravity of masses and masses govern the variable speed of light, (DeH)

- allows to revisit Einstein's thoughts on ETHER AND THE THEORY OF RELATIVITY in the context of the space-time theory and the kinematics of the special theory of relativity modelled on the Maxwell-Lorentz theory of the electromagnetic field

- acknowledge the Mach principle as a selecting principle to select the appropriate cosmology model out of the few existing physical relevant ones, (DeH)

- aknowledge Bohm's property of a "particle" in case of quantum fluctuation, (BoD), chapter 4, section 9, (SmL).

From a mathematical perspective the two fundamental model changes are :

- the Dirac's H(-n/2-e)-based point charge model is replaced by a H(-1/2)-based quantum element model

- the GRT metric space concept (equipped with an (only) "exterior" product of differential forms and accompanied by the (global nonlinear stable, (ChD)) Minkowski space) is replaced by a H(1/2)-quantum energy Hilbert space concept, equipped with the H(1/2)-inner product of differential forms

The new framework enables further solutions to current challenges e.g. regarding the „first mover" question (inflation, as a prerequiste) of the „Big Bang" theory, the symmetrical time arrow of the (hyperbolic) wave (and radiation) equation (governing the light speed and derived from the Maxwell equations by differentiation), no long term stable and well-posed 3D-NSE, no allowed standing (stationary) waves in the Maxwell equation and the related need for the YME extention, resulting into the mass gap problem, the mystery of the initial generation of an uplift force in a modelled ideal fluid environment of the wings, i.e. no fluids collisions with the wings surfaces, and a Landau equation based proof of the Landau damping phenomenon.