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Complex-Dynamical Solution to Many-Body Interaction Problem and Its Applications in Fundamental Physics

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We review the recently proposed unreduced, complex-dynamical solution to many-body problem with arbitrary interaction and its application to unified solution of fundamental problems, including foundations of causally complete quantum mechanics, relativity, particle properties and cosmology. We first analyse the universal properties of many-body problem solution without any perturbative reduction and show that the emerging new quality of fundamental dynamic multivaluedness (or redundance) of resulting system configuration leads to universal concept of dynamic complexity, chaoticity and fractality of any real system behaviour. We then consider unified features of this complex dynamics. Applications of that universal description to systems at various complexity levels have been performed and in this paper we review those at the lowest, fundamental complexity levels leading to causal understanding of unified origins of quantum mechanics, relativity (special and general), elementary particles, their intrinsic properties and interactions. One reveals, in particular, the complex-dynamic origin of inertial and gravitational (relativistic) mass without introduction of any additional particle species, fields and dimensions. Other practically important consequences and problem solutions in fundamental physics and cosmology are summarised, confirming the efficiency of that unified picture.

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