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Mass without mass: A solution of the millennium yang-mills problem

In 2000 the Clay Mathematics Institute proposed seven fundamental mathematical problems. Among others, the “Quantum Yang-Mills theory problem” requires a mathematically complete proof of a positive mass gap in the Yang-Mills spectrum on the four-dimensional Minkowski vector space. In contrast, the classical Lagrangian of Yang-Mills field theory has no mass quadratic form, but only a self-interaction quartic form. I review the background and the statement of the problem. Then I outline my Higgless solution via the canonical second quantization of classical Yang-Mills Hamiltonian. Details involve intrinsic properties of the classical Yang-Mills theory, such as global correctness of the Cauchy problem and the simplicity of the compact gauge group (to be explained). The canonical quantization is done in terms of the infinitely-dimensional holomorphic calculus of creation and annihilation operators (to be reviewed as well). Thus the non-linear classical Yang-Mills Hamiltonian functional generates a linear self-adjoint quantum Hamiltonian operator in the holomorphic Fock space. Then a positive mass gap is estimated from below via the spectral minimax principle.

Biography

Alexander Dynin received the PhD in Mathematics and Physics at Steklov Mathematical Institute (Russia) in 1961. During 1963-1968 he worked at the Joint Institute of Nuclear Research (Dubna, Russia). The dissertation was awarded the premium of Moscow Mathematical in the year 1962. During 1977-1978 he was a member of the Institute of Advanced Studies (Princeton, the USA). During 1978-1980 was a professor at State University of New York and during 1980 -2014 a professor at Ohio State University (Columbus, Ohio), and since then a Professor Emeritus of Mathematics therein.

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