The reasonable effectiveness of mathematical deformation theory in physics, especially quantum mechanics and maybe elementary particle symmetries

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Abstract

In 1960 Wigner marveled about "the unreasonable effectiveness of mathematics in the natural sciences," referring mainly to physics. In that spirit we shall first explain how a posteriori relativity and quantum mechanics can be obtained from previously known theories using the mathematical theory of deformations. After a tachyonic overview of how the standard model of elementary particles arose from empirically guessed symmetries we indicate how these symmetries could (very reasonably) be obtained from those of relativity using deformations (including quantization). This poses difficult and interesting mathematical problems with potentially challenging applications to physics.”

Short Biography

Dr Daniel Sternheimer is one of the fathers of an exact formulation of deformation quantization. Some of the topics he worked on (and on some he still continues working) are the fundamental symmetry properties of elementary particles, quantum gravity, foundations of quantum mechanics, conformal symmetry, quantum field theory, Lie algebras, general deformation concepts, quantum groups, Hopf algebras, cohomology, Nambu mechanics, AdS universe and singleton physics. He was a member of the CNRS (first in Paris then in Dijon) till his retirement in 2003. Furthermore, he was and still is a member of the Mathematics Institute of the Universit’e du Bourgogne. From 2004 to 2010 he was Visiting Professor at the University of Keio and since 2010 he is Visiting Researcher at the Rikkyo University in Tokyo. In 2004 he was appointed Honorary Professor of the University Of Sankt Petersbourg Russia.