



## TOHOKU FORUM for CREATIVITY

Tohoku Forum for Creativity Thematic Program 2015

Fundamental Problems in Quantum Physics: Strings, Black Holes and Quantum Information

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### Seminar

"The unreasonable effectiveness of mathematical deformation theory in physics, especially quantum mechanics and maybe elementary particles symmetries"

Daniel Sternheimer (Rikkyo University, Université de Bourgogne)

Date: Tuesday, April 21, 17:00-18:00

Tokyo Electron House of Creativity

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### Abstract

New fundamental physical theories can, so far a posteriori, be seen as emerging from existing ones via some kind of deformation. The main paradigms are the physics revolutions from the beginning of the twentieth century, quantum mechanics (via "deformation quantization") and special relativity (symmetry deformation from the Galilean to the Poincaré groups). I shall explain the mathematical and physical basics, especially of deformation quantization, and describe some consequences. In the latter part of last century arose the standard model of elementary particles, based on empirically guessed symmetries: I shall indicate how its symmetries might "emerge" from the symmetry of relativity by "geometric" deformation (to Anti de Sitter, and singleton physics for photons and leptons) and quantum groups deformation quantization (for hadrons), and give the flavour of the hard mathematical problems raised, a solution to which might lead to a re-foundation of half a century of particle physics.