The two major physical theories, relativity and quantization, can be understood as deformations. The former became obvious as soon as deformation theory of algebras appeared (at the same time as index theorems) but it took 10 – 20 more years before deformation quantization established mathematically the latter (and clarify relations with index theorems). In this talk we shall insist on the conceptual aspects, that can be understood – and hopefully used in their own areas – by both mathematicians and physicists.

After mentioning lesser known aspects of the particle physics context, we give a tachyonic overview of deformation quantization, its origins and manifold ramifications. In the 60’s the question was raised on whether there is any connection between “external symmetries” (the Poincaré group) and the (empirically found) “internal symmetries” of elementary particles. The latter eventually gave, in the second half of the twentieth century, the Standard Model (SM) and the dynamics built around it. We claim that the question of connection could be a false problem, i.e. maybe the “internal symmetries” emerge from Poincaré by some kind of deformation (possibly generalized and including quantization).

In the anti de Sitter (AdS) deformation of Poincaré, photons are dynamically composites (of singletons), and (using flavor symmetry) leptons can be considered there as composite (massified by 5 Higgs). But quantum groups (deformations of Hopf algebras) at root of unity have finite dimensional UIRs. Thus maybe the achievements of the SM can be obtained from AdS by generalized quantization and possibly some form of loop AdS algebra to ‘blow up’ field theoretical singularities. Whether such (conceptually appealing) frameworks for models have any relevance to physics is too early to tell, but that should give nontrivial new maths, and phenomenological work for at least a generation.

About the speaker

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Admission is free. For registration of attendance, please email louislimym@ntu.edu.sg