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# Altneuland in mathematical particle physics: back to the drawing board??

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**Long Abstract**

Flato's "deformation philosophy" explains how new physical theories can be seen as emerging from existing ones. Relativity is the most flagrant paradigm, but a perhaps more important one is "our" deformation quantization which gives a framework in which quantization can be understood as a deformation of the classical (commutative) composition law of observables. In the 60's a by now old question was the connection between the Poincaré group of relativity and the newly empirically introduced "internal symmetries" of elementary particles. In spite of our objections of that time, that "it ain't necessarily so", it is widely assumed that there is none. In this talk we show that the "old question" could be a false problem and that mathematics, newly developed and/or to be extended in a variety of directions, indicates how internal symmetries might emerge from external ones by some kind of deformation, including quantization. Conjecturally there would be a deformations-based space-time origin of elementary particle (super)symmetries, via the Anti de Sitter (space and/or symmetry) deformation of those of special relativity that would be quantized in some sense, probably if within Gerstenhaber's deformation theory, at (sixth?) root of unity where finite-dimensional Hopf algebras appear, but maybe in a more general sense to be developed, with quaternionic or a finite number of (possibly noncommutative) "deformation parameters."

That admittedly is a most ambitious program, which if successful could either give solid foundations to the "standard model" or show how to go back to the drawing board and modify it on solid ground, with far reaching consequences also on the experimental and phenomenological levels, especially since the interpretation of raw experimental data is in part based on the existing model(s). And then the associated dynamics might also require a revision, not so much QED or the electroweak theory than later developments. "If you will, it is no legend" was the motto of Herzl's utopian 1902 novel titled "Altneuland" (the Hebrew title is "Tel Aviv" and the name of the city was inspired by that novel). Future will tell if the program proposed here, in the spirit of what Flato and I have done since the 60's and of what Einstein wrote (*the important thing is not to stop questioning*) will remain an utopy for particle physics or, after a couple of generations, develops into a vibrant and well based theory. In any case on the mathematical side the questions it suggests are worth studying, for the most part hard and challenging.