Abstract

The Algebraic Birkhoff Factorization (ABF) of Connes and Kreimer gives an algebraic formulation of the renormalization process in quantum field theory. Their ABF is an factorization of an algebra homomorphism from a Hopf algebra to a Rota-Baxter algebra. This algebraic formulation facilitates the mathematical study in renormalization and allows the renormalization method to be applied to divergency problems in mathematics.

In this talk we first give an introduction to ABF with a baby model for renormalizing Riemann integrals, in the spirit of dimensional regularization into Laurent series. To deal with multivariant regularizations, we develop a Laurent series theory for meromorphic germs with linear poles and formulate the ABF in the locality setting. As an application in the context of the Euler-Maclaurin formula on lattice cones, we renormalize the exponential generating function which sums over the lattice points in a lattice cone. We also revisit the analytic renormalization of Speer. Despite the analytic and physics background, the talk is mostly algebraic and combinatorial.

The talk is from joint works with P. Clavier, S. Paycha and B. Zhang.