Universität Hamburg
DER FORSCHUNG | DER LEHRE | DER BILDUNG

Fakultät für
Mathematik, Informatik
und Naturwissenschaften

Kolloquium über Reine Mathematik

Einladung zu einem Vortrag

Dienstag, 7. Mai 2019

17 Uhr s.t., Geom H4

Prof. Dr. Joachim Kock
(Universitat Autònoma de Barcelona)

Combinatorial Dyson-Schwinger equations, polynomial functors, and inductive types

Abstract:

After briefly explaining the origin of the combinatorial Dyson-Schwinger in quantum field theory, I will show how they can be understood in terms of some elementary category theory, leading to an interpretation in constructive type theory. The standard formulation of the equations by Bergbauer and Kreimer starts with a Hopf algebra (of trees or graphs) and a collection of Hochschild 1-cocycles, and one of their main theorems is that the solution spans a sub Hopf algebra isomorphic to the Faa di Bruno Hopf algebra (the Hopf algebra dual to composition of formal power series). The new categorical interpretation starts very abstractly with a polynomial fixpoint equation of sets, nothing more. I will explain how this data canonically generates trees, Hopf algebras, Hochschild 1-cocycles, and Faa di Bruno formula. In particular, this exhibits the solution, the so-called combinatorial Green function, as an inductive type in the sense of constructive type theory. (No particular background in quantum field theory, category theory or logic is assumed.)

Vor dem Vortrag (ab 16.30 Uhr) stehen im Raum 327 Kaffee und Tee bereit.