Publisher’s description: This volume is the outcome of a CIRM Workshop on Renormalization and Galois Theories held in Luminy, France, in March 2006. The subject of this workshop was the interaction and relationship between four currently very active areas: renormalization in quantum field theory (QFT), differential Galois theory, noncommutative geometry, motives and Galois theory.

The last decade has seen a burst of new techniques to cope with the various mathematical questions involved in QFT, with notably the development of a Hopf-algebraic approach and insights into the classes of numbers and special functions that systematically appear in the calculations of perturbative QFT (pQFT). The analysis of the ambiguities of resummation of the divergent series of pQFT, an old problem, has been renewed, using recent results on Gevrey asymptotics, generalized Borel summation, Stokes phenomenon and resurgent functions.

The purpose of the present book is to highlight, in the context of renormalization, the convergence of these various themes, orchestrated by diverse Galois theories. It contains three lecture courses together with five research articles and will be useful to both researchers and graduate students in mathematics and physics.

The articles of this volume will be reviewed individually.

Indexed articles:

Consani, Caterina, Noncommutative geometry and motives (à quoi servent les endomotifs?), 1-37 [Zbl 1183.14003]

Rivasseau, Vincent; Vignes-Tourneret, Fabien, Renormalisation of non-commutative field theories, 39-82 [Zbl 1185.81116]

Sauzin, David, Mould expansions for the saddle-node and resurgence monomials, 83-163 [Zbl 1191.34104]

André, Yves, Galois theory, motives and transcendental numbers, 165-177 [Zbl 1219.11109]

Ebrahimi-Fard, Kurusch; Manchon, Dominique, The combinatorics of Bogoliubov’s recursion in renormalization, 179-207 [Zbl 1207.81081]

Hoffman, Michael E., (Non)commutative Hopf algebras of trees and (quasi)symmetric functions., 209-227 [Zbl 1183.16029]

Menous, Frédéric, Formal differential equations and renormalization, 229-246 [Zbl 1182.81057]

Weinzierl, Stefan, Feynman integrals and multiple polylogarithms, 247-270 [Zbl 1182.81037]

MSC:

14-06 Proceedings, conferences, collections, etc. pertaining to algebraic geometry
81-06 Proceedings, conferences, collections, etc. pertaining to quantum theory
12-06 Proceedings, conferences, collections, etc. pertaining to field theory
00B25 Proceedings of conferences of miscellaneous specific interest
81T15 Perturbative methods of renormalization applied to problems in quantum field theory
81T75 Noncommutative geometry methods in quantum field theory
14A22 Noncommutative algebraic geometry
14F42 Motivic cohomology; motivic homotopy theory
12F10 Separable extensions, Galois theory

Full Text: DOI