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V. Turaev, A. Virelizier

Monoidal Categories and Topological Field Theory

Series: Progress in Mathematics, Vol. 322

- Offers a detailed exposition accessible to students
- Provides numerous figures
- Winner of the 2016 Ferran Sunyer i Balaguer Prize

This monograph is devoted to monoidal categories and their connections with 3-dimensional topological field theories. Starting with basic definitions, it proceeds to the forefront of current research.

Part 1 introduces monoidal categories and several of their classes, including rigid, pivotal, spherical, fusion, braided, and modular categories. It then presents deep theorems of Müger on the center of a pivotal fusion category. These theorems are proved in Part 2 using the theory of Hopf monads. In Part 3 the authors define the notion of a topological quantum field theory (TQFT) and construct a Turaev-Viro-type 3-dimensional state sum TQFT from a spherical fusion category. Lastly, in Part 4 this construction is extended to 3-manifolds with colored ribbon graphs, yielding a so-called graph TQFT (and, consequently, a 3-2-1 extended TQFT). The authors then prove the main result of the monograph: the state sum graph TQFT derived from any spherical fusion category is isomorphic to the Reshetikhin-Turaev surgery graph TQFT derived from the center of that category.

The book is of interest to researchers and students studying topological field theory, monoidal categories, Hopf algebras and Hopf monads.



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