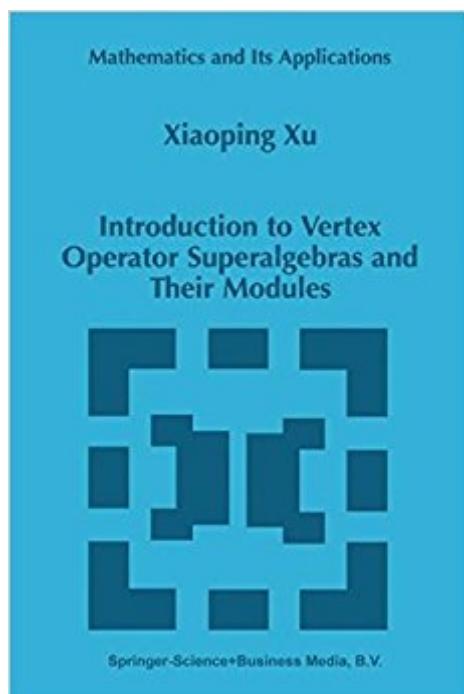


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# Introduction To Vertex Operator Superalgebras And Their Modules (Mathematics And Its Applications)



## Synopsis

Vertex algebra was introduced by Borcherds, and the slightly revised notion "vertex operator algebra" was formulated by Frenkel, Lepowsky and Meurman, in order to solve the problem of the moonshine representation of the Monster group - the largest sporadic group. On the one hand, vertex operator algebras can be viewed as extensions of certain infinite-dimensional Lie algebras such as affine Lie algebras and the Virasoro algebra. On the other hand, they are natural one-variable generalizations of commutative associative algebras with an identity element. In a certain sense, Lie algebras and commutative associative algebras are reconciled in vertex operator algebras. Moreover, some other algebraic structures, such as integral linear lattices, Jordan algebras and noncommutative associative algebras, also appear as subalgebraic structures of vertex operator algebras. The axioms of vertex operator algebra have geometric interpretations in terms of Riemann spheres with punctures. The trace functions of a certain component of vertex operators enjoy the modular invariant properties. Vertex operator algebras appeared in physics as the fundamental algebraic structures of conformal field theory, which plays an important role in string theory and statistical mechanics. Moreover, conformal field theory reveals an important mathematical property, the so called "mirror symmetry" among Calabi-Yau manifolds. The general correspondence between vertex operator algebras and Calabi-Yau manifolds still remains mysterious. Ever since the first book on vertex operator algebras by Frenkel, Lepowsky and Meurman was published in 1988, there has been a rapid development in vertex operator superalgebras, which are slight generalizations of vertex operator algebras.

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