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Sinopsis

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This book presents a systematic approach to conformal field theory with gauge symmetry from the point of view of complex algebraic geometry. After presenting the basic facts of the theory of compact Riemann surfaces and the representation theory of affine Lie algebras in Chapters 1 and 2, conformal blocks for pointed Riemann surfaces with coordinates are constructed in Chapter 3. In Chapter 4 the sheaf of conformal blocks associated to a family of pointed Riemann surfaces with coordinates is constructed, and in Chapter 5 it is shown that this sheaf supports a projective flat connection--one of the most important facts of conformal field theory. Chapter 6 is devoted to the study of the detailed structure of the conformal field theory over $\mathbb{P}^1$. Recently it was shown that modular functors can be constructed from conformal field theory, giving an interesting relationship between algebraic geometry and topological quantum field theory. This book provides a timely introduction to an intensively studied topic of conformal field theory with gauge symmetry by a leading algebraic geometer, and includes all the necessary techniques and results that are used to construct the modular functor.