

Three-dimensional TQFT and twisted K-theory

Dan Freed

A serendipitous discovery: The Verlinde algebra of a compact Lie group G is the twisted G -equivariant K-theory of BG , where G acts on itself by the adjoint action. The twisting is related to the "level" of the theory. This is the subject of ongoing work with my co-discoverers, Mike Hopkins and Constantin Teleman. On the one hand, for connected G there is a connection to representations of the loop group LG . On the other hand, the Verlinde algebra fits nicely into a three-dimensional topological field theory---Chern-Simons theory---which is usually defined in terms of a "quantum group" or "modular tensor category." The appearance of twisted K-theory has a heuristic explanation in terms of the quantum field theory. On the topological side, we encounter interesting torsion phenomena for twistings of K-theory.