Elliptic representation theory

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There are three distinguished Riemann surfaces $C$ which are naturally groups: the complex line, the complex line without the origin, and elliptic curves. Because of their symmetry, gauge theory over these Riemann surfaces is a concrete enterprise. It leads to fundamental objects in representation theory such as characters (for finite groups) and Lusztig’s character sheaves (for Lie groups). After an account of past successes, we will focus on the least well understood setting of an elliptic curve. Here the geometry provides two Langlands dual realizations, one confirmed and one expected, for the rich depth zero character theory of $p$-adic and loop groups.

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