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Character sheaves of algebraic groups defined over local fields

At the beginning of the paper introducing character sheaves of connected reductive algebraic groups, George Lusztig wrote:

This paper is an attempt to construct a geometric theory of characters of a reductive algebraic group G defined over an algebraically closed field. We are seeking a theory which is as close as possible to the theory of irreducible (complex) characters of the corresponding groups $G(\mathbb{F}_q)$ over a finite field \mathbb{F}_q , and yet it should have a meaning over algebraically closed fields. The basic objects in the theory are certain irreducible (ℓ -adic) perverse sheaves ... on G ; they are the analogues of the irreducible (ℓ -adic) representations of $G(\mathbb{F}_q)$ and are called the character sheaves of G .

Making use of the *dictionnaire fonctions-faisceaux*, Lusztig then showed that there is indeed a close relation between certain character sheaves of connected reductive algebraic groups G defined over finite fields \mathbb{F}_q and characters of representations of the group $G(\mathbb{F}_q)$.

In this talk we introduce machinery which likewise establishes that there is a close relation between certain character sheaves of connected reductive algebraic groups G defined over local fields \mathbb{K} and characters of certain representations of the group $G(\mathbb{K})$. We do this by considering a family of integral models for G and applying the corresponding vanishing cycles functors to character sheaves of G . The main results of the talk concern techniques by which the resulting families of vanishing cycles of perverse sheaves can be determined.