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Two-dimensional Morita theory and Galois cohomology

To each commutative ring we can naturally associate three groups: the group of units, the Picard group (the group of isomorphism classes of invertible modules), and the Brauer group (consisting of Morita equivalence classes of Azumaya algebras). Starting with an arbitrary commutative ring, John Duskin constructed a topological space whose homotopy groups are isomorphic to these three groups. Ross Street gave a construction of this space as the nerve of a monoidal bicategory.

If we work with a field, the unit, Picard, and Brauer group coincide with the first three Galois cohomology groups. In my talk I will outline the construction of a monoidal tricategory which, conjecturally, has the property that the homotopy groups of its nerve coincide with the first four Galois cohomology groups. The key ingredient is a generalization of Morita theory and Azumaya algebras to the context of two-dimensional category theory. This is work in progress, joint with Evan Jenkins.