The complexity of algebraic structures

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Quadratic forms and central simple algebras over fields arise naturally in constructions in algebra, number theory and geometry. Obstructions to obtain simple descriptions of these types of objects is measured by such invariants as the Pfister numbers, essential dimensions, symbol length and u-invariants. Even when the underlying field is the function field of a variety, there are still many conjectures and open questions about the behavior of these invariants. I will discuss some of these conjectures, as well as some recent progress on them.