The exceptions that prove the rule

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Several types of algebraic structures have classification theorems showing that the simple (in a technical sense) examples of the structure fall into a small number of well-understood infinite families, but with a finite number of exceptions. These exceptions are often associated with the non-associative algebra of octonions, which makes them also understandable in the same terms as the infinite families. I will explore this with particular reference to the case of Lie algebras.