Hyperbolic Reflection Groups and Lie Algebras

The famous Cartan-Killing classification of semisimple Lie algebras proceeds by showing that that the Lie algebra structure is almost completely controlled by a finite group generated by reflections of Euclidean space. In the 1960's, Kac and Moody introduced Lie algebras that are like those of Killing-Cartan, but are infinite-dimensional, and now the reflection group is infinite and acts on hyperbolic space (for example). These algebras now play a major role in several parts of math and physics. I will survey recent and current research on the problem of classifying them. In a sense their numbers are so vast that classification is pointless, but the "interesting" ones seem to be finite in number. Exactly what this means and what the classification is are active topics of research.