The McKay Correspondence

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For a finite subgroup G of $SL(n, \mathbf{C})$ one may consider the ordinary (commutative) geometry of crepant resolutions of the quotient singularity $\mathbf{C}^n/G$ and also the (mildy non-commutative) G-equivariant geometry of $\mathbf{C}^n$ itself. The McKay correspondence — first observed for $\mathbf{C}^2$, but now much studied for $\mathbf{C}^3$ — describes the relationship between these two.

This mini-course will survey some of the history of the correspondence from Gonzalez-Sprinberg and Verdier's K-theoretic interpretation of McKay's original observation, to the more modern interpretation as an equivalence of derived categories of sheaves on the resolution and of equivariant sheaves on $\mathbf{C}^n$.

The course will also describe some more recent progress, including Craw & Ishii's result that all projective crepant resolutions of abelian quotients of $\mathbf{C}^3$ can be realised as moduli of equivariant sheaves and Logvinenko's theory of G-equivariant divisors.