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Convex orders on roots, PBW bases, and polytopes.

Consider the integral form of a quantum group. One natural (if somewhat naive) question is to write down a basis. Early in the history of quantum groups Lusztig did this, and in fact he considered a number of bases: one for each reduced expression in the Weyl group, or equivalently one for each convex order on simple roots. He also considered the problem of how these different bases are related. This gives rise to some combinatorics, which has recently been re-understood using Mirkovic-Vilonen (MV) polytopes. That connection reveals various connections, for instance to geometry. I will discuss this story, along with some recent work on the affine situation.