SMOOTHING TORIC FANO THREEFOLDS

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Abstract: Laurent Inversion (LI) is a smoothing construction designed to find mirror pairs in the Fano case. Given a Laurent polynomial $f$ supported on a 3D Fano polytope $P$, let $X_P$ be the associated toric Fano threefold. The general LI construction then embeds $X_P$ inside an ambient toric variety $F$. If in addition $X_P$ is a complete intersection defined by line bundles on $F$, taking a general section gives a variety $X$ which degenerates to $X_P$. The goal is for $X$ to be as smooth as possible.

The principal motivation for these constructions is the following: there is a conjectured one-to-one correspondence between certain deformation families of Fano varieties and equivalence classes of polytopes. Using this information, one can state a precise version of the mirror theorem for Fano varieties. In the context above, this directly translates to $f$ being the mirror of $X$. 