Sums of squares and nonnegative polynomials in multigraded rings

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A polynomial with real coefficients is nonnegative if it takes on only nonnegative values. For example, any sum of squares is obviously nonnegative. For a homogeneous polynomial with respect to the standard grading, Hilbert famously characterized when the converse statement hold, i.e. when every nonnegative homogeneous polynomial is a sum of squares. In this talk, we will examine this converse for homogenous polynomials with respect to a positive multigrading. In particular, we will provide many new examples in which every nonnegative homogeneous polynomial is a sum of squares.