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**Grigoriy Blekherman, Daniel Plaumann, Rainer Sinn and Cynthia Vinzant\***  
([clvinzan@ncsu.edu](mailto:clvinzan@ncsu.edu)). *Polynomials as sums of few squares.*

The classes of polynomials for which every nonnegative polynomial is a sum of squares is an important subject dating back to Hilbert. I will discuss the number of squares needed in these representations and give a tight bound in terms of the number of variables. This generalizes the celebrated result by Hilbert that every real nonnegative ternary quartic is a sum of three squares. Applying this theory to polynomials called biforms gives low-rank factorizations of positive semidefinite bivariate matrix polynomials. For polynomials in two variables, we can also count the number of representations as a sum of few squares. (Received September 19, 2016)