1116-14-2712 **Timo de Wolff*** (dewolff@math.tamu.edu), Department of Mathematics, Mailstop 3368, Texas A&M University, College Station, TX 77843-3368, and **Sadik Iliman**. *Nonnegative Polynomials and Sums of Squares Supported on Circuits.*

Deciding nonnegativity of real polynomials is a key question in real algebraic geometry with crucial importance in polynomial optimization. Since this problem is NP-hard, one is interested in finding sufficient conditions (certificates) for nonnegativity, which are easier to check. The standard certificates are sums of squares (SOS), which trace back to Hilbert (see Hilbert's 17th problem).

In this talk we completely characterize sections of the cones of nonnegative polynomials and sums of squares with polynomials supported on circuits, a genuine class of sparse polynomials. Nonnegativity of polynomials supported on circuits is characterized by an invariant, which can immediately be derived from the initial polynomial. Based on these results, we obtain a completely new class of nonnegativity certificates independent from SOS certificates. These results significantly extend known geometric programming approaches for the computation of lower bounds. For polynomials with simplex Newton polytope these new bounds are much faster computable and often better than bounds obtained via semidefinite programming, which is the current standard method for nonlinear polynomial optimization. (Received September 22, 2015)