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Projective geometry related to the classical  
Monge–Ampère differential equation

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In this talk I will review some classical results about projective hypersurfaces with identically vanishing Hessian polynomial (whence the relation with the MA equation). Then I will turn to the so called homaloidal hypersurfaces, i.e. those defined by homogeneous polynomials for which the polar map is birational in projective space. I will give examples and discuss the (not so many) known results about them and relations with other branches of algebraic geometry. Finally I will talk about the existence of various families of irreducible homaloidal hypersurfaces in projective space  $\mathbb{P}^r$ , for all  $r \geq 3$ . One of these is a family of hypersurfaces whose degrees are arbitrarily large when compared to the dimension  $r$  of the ambient projective space. It was so far unknown whether the degree of irreducible homaloidal polynomials could be bounded in terms of  $r$  or not.

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