1114-13-160 **Maral Mostafazadehfard*** (maral@math.utah.edu) and **Aron Simis**. *Homaloidal Determinants.*

Let $R = k[x_0, \cdots, x_n]$ be a polynomial ring over a field of characteristic zero. A birational transformation of P^n is called a Cremona transformation. An important class of Cremona maps comes off Polar maps, That is, the rational map $\nabla f : P^n \dashrightarrow P^n$ of the hypersurface $D = V(f)$ given by partial derivatives of f, where f is a homogeneous polynomial. The polynomial f or the hypersuface D is homaloidal when its polar map is a cremona transformation.

In this talk the focus is on the determinant of a generic Hankel matrix and one of its degenerations. We show that the first has nonvanishing Hessian (hence its polar map defines a dominant rational map) but it is non-homaloidal. In the degeneration case we determine the ideal theoretic and numerical invariants of the corresponding gradient (polar) ideal, as well as its homological nature. Moreover, a conjecture of Ciliberto-Russo-Simis(2008) is proved. We also bring out the determinant of a circulant matrix, which is also homaloidal. All results draw on some nontrivial underlying commutative algebra. All cases of study are saturated non Cohen-Macaulay polar ideals but up to radical they are perfect of codimension 2 or 3. (Received August 24, 2015)