1054-14-311 **Karen A Chandler*** (chandler@math.ucr.edu), University of California, Riverside, Math Department, Riverside, CA 92521-0135. *Multiple points in higher dimensions.*

Given a point $p \in \mathbb{P}^n$ with maximal ideal $\mathfrak{m}$ the k**-uple fat point scheme** at p is the scheme defined by $\mathfrak{m}^k$. We consider the natural extension of the Lagrange-Hermite theorem on the line to a (general) collection of points in higher dimensions. Further, we examine the Hilbert function of such a scheme to determine, geometrically, when a polynomial of lower degree cannot meet the specified criteria. This problem has been examined in $\mathbb{P}^2$, according to conjectures of Nagata and of Segre-Harbourne-Hirschowitz. Results since the 1990's include those of Hirschowitz, Ciliberto-Miranda, and Yang on points of orders at most 19 in the plane.

We have been studying this problem in higher dimensions in which, by contrast, one sees more subtle phenomena. Here we apply our geometric interpretation of conjectures of Iarrobino and methods to obtain:

Theorem. Take d general points in n-dimensional space. We may specify the partial derivatives up to orders two at each point to a polynomial of degree m at least 7 provided that: $\binom{n+2}{2} d \leq \binom{n+m}{m}$. Similarly for a union of double points and triple points. (Received September 16, 2009)