Meeting: 1003, Atlanta, Georgia, AMS CP 1, AMS Contributed Paper Session

1003-14-273 **Mark E. Huibregtse*** (mhuibreg@skidmore.edu), Dept. of Mathematics & Computer Science, Skidmore College, Saratoga Springs, NY 12866. *The cotangent space at a monomial ideal of the Hilbert scheme of points of an affine space.* Preliminary report.

We study the cotangent space of a point t corresponding to a monomial ideal $I \subseteq \mathsf{k}[x_1, \ldots, x_r]$ in the Hilbert scheme of n points of affine r-space (so $\dim_{\mathsf{k}}(\mathsf{k}[\mathbf{x}]/I) =$ colength of $I = n$). Since t lies in the closure of the locus corresponding to subschemes supported at n distinct points of $\mathbb{A}^r_{\mathsf{k}}$, one knows that the k-dimension of the cotangent space is always $\geq r \cdot n$, and that t is nonsingular if and only if the dimension equals $r \cdot n$. We construct an explicit linearly independent set $\mathcal{S}$ of cotangent vectors of size $r \cdot n$, and then explore conditions on I under which $\mathcal{S}$ either is or is not a basis of the cotangent space. In particular, we give conditions on I sufficient for $\mathcal{S}$ to be a basis (equivalently, for t to be nonsingular) that hold for every monomial ideal in the case of $r = 2$ variables. We also give an easily-checked condition on I sufficient for $\mathcal{S}$ not to be a basis. (Received September 25, 2004)