1049-60-169 **Charlie Brubaker** and **Santosh S Vempala*** (vempala@cc.gatech.edu), Georgia Tech, Atlanta, GA 30332. *Random Tensors and Planted Cliques.* Preliminary report.

A random graph on n vertices where each edge is chosen with probability $1/2$ has a clique of size nearly $2\log n$ with high probability. What if a larger clique were planted in a random graph? Could we find it in polynomial time? For general graphs, approximating the maximum clique is an intractable problem. Does the situation get better with random graphs? The current best algorithm can find a planted clique of size roughly $\sqrt{n}$. However, any planted clique of size greater than $2\log n$ is unique with high probability, so there is large gap here. In a recent remarkable paper, Frieze and Kannan introduced a tensor-based method that could reduce the size of the planted clique to as small as roughly $n^{1/3}$. Their method relies on finding the spectral norm of a 3-dimensional tensor, a problem whose complexity is open. Moreover, their combinatorial proof does not seem to extend beyond this threshold. We show how to recover the Frieze-Kannan result using a purely probabilistic argument which generalizes naturally to r-dimensional tensors and lets us recover cliques of size as small as $poly(r).n^{1/r}$ provided we can find the spectral norm of r-dimensional tensors. (Received March 02, 2009)