1104-53-98 **Jason H Cantarella***, UGA Math Department, Boyd GSRC, Athens, GA 30602, and **Clayton Shonkwiler**. *New Algorithms for Sampling Closed Equilateral Random Walks in* $\mathbb{R}^3$ *based on Symplectic Geometry.* Preliminary report.

An equilateral random walk in $\mathbb{R}^3$ is formed by sampling steps uniformly on S^2 and summing these steps to form a space polygon. The polygon is closed $\iff$ the vector sum of the steps is $\vec{0}$.

This means that closed equilateral random walks in $\mathbb{R}^3$ are sampled from the volume measure on the $2n-3$ dimensional submanifold of $(S^2)^n$ defined by the closure condition $\sum \vec{e_i} = \vec{0}$. If we take the quotient of this space under the (diagonal) action of $SO(3)$, we get a $2n-6$ dimensional manifold of "closed random walks up to rotation".

It has been known since the 90's that this smaller manifold has a toric symplectic structure. In this talk, we use the toric symplectic structure to create new algorithms for sampling from this manifold. These algorithms are of interest in the numerical simulation and probabilistic analysis of closed "ring" polymers in solution. (Received August 25, 2014)