1163-33-1321 **Persi Diaconis*** (diaconis@math.stanford.edu), Department of Statistics, Sequoia Hall, 390 Serra Mall, Stanford, CA 94305, and **Chenyang Zhong** (cyzhong@stanford.edu), Department of Statistics, Sequoia Hall, 390 Serra Mall, Stanford, CA 94305. *Orthogonal Polynomials and the Burnside Process.*

Let X be a finite set and G a finite group acting on X. This splits X into orbits. The Burnside process gives a method of choosing a uniformly random orbit. This includes problems of choosing unlabeled objects (e.g., trees) or partitions. The process is simple. From x choose a random element g fixing x and then a random element y fixed by g (both choices uniform). This gives a Markov chain $K(x, y)$ being the chance of moving from x to y in one step. This Chain, suggested by Mark Jerrum, has stationary distribution $pi(x)$ proportional to $1/|orbit(x)|$. It is a special case of the 'hit and run algorithm' which includes the Swedsen-Wang data augmentation and many other special cases. Most of these have resisted analysis, even though they are widely used.

As usual, one may ask for rates of convergence for this Markov chain to stationarity. If X is the set of binary n-tuples, G is the symmetric group $S(n)$, then orbits are indexed by $0, 1, ..., n$ and the chain has a Bose-Einstein stationary distribution. It turns out that the chain is diagonalizable by dual Hahn polynomials and sharp rates of convergence ensue–a finite number of steps suffice, no matter how large n is. There should be many other cases where orthogonal polynomials can be used. (Received September 15, 2020)