1151-20-164 **Meng-Che Ho*** (turboho@gmail.com), Department of Mathematics, Purdue University, 150 N. University Street, West Lafayette, IN 47907-2067, and **William Cocke**. *The probability distribution of word maps on finite groups.*

For a group G, every element $w \in F_m$ naturally defines a *word map* from $w : G^m \to G$ by substitution and multiplication in G. These maps can be thought of as polynomials in groups, and they provide a wealth of information about finite groups. We examine the connection between the probability distribution induced by a word map and the underlying structure of a finite group. We show that a finite group is nilpotent if and only if every surjective word map has fibers of uniform size. As a corollary, we show that probability distributions themselves are sufficient to identify nilpotent groups, and these same distributions can be used to determine abelian groups up to isomorphism. (Received August 19, 2019)