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**Robert M. Guralnick\*** (guralnic@usc.edu), University of Southern California, Department of Mathematics, 3620 Vermont Ave., Los Angeles, CA 90089-2532. *Generators and Relations for Finite Groups.*

Suppose that  $G$  is a group that can be generated by  $d$  elements. Then we can identify  $G = F/R$  where  $F$  is a free group of rank  $d$  and  $R$  is a normal subgroup. We are interested in getting bounds for the minimal number of generators needed for  $G$  as well as  $r$  the minimal number of relations for  $G$  – i.e. the minimal number of elements of  $R$  that generate  $R$  as a normal subgroup of  $F$ . If  $G$  is finite, it is well known that  $r \geq d$ . These are very natural concepts that come up in studying groups. They are also useful in computational group theory and in applications of group theory to geometry and number theory.

We will mostly deal with finite groups and a critical case is for finite simple groups. We will discuss the result that all finite simple groups can be generated by two elements and extensions of this result. We will discuss some techniques using algebraic geometry and probabilistic methods. We will also discuss some recent results of the speaker with Kantor, Kassabov and Lubotzky on the number and length of relations required.

Finally, we will discuss these ideas in the context of profinite groups and connections with low degree cohomology. (Received August 30, 2012)