

1116-VF-1211 **Noah James Watson***, James Madison University, VA , and **Jonathan M Gerhard**, James Madison University. *Smith and Critical Groups of the Rook's Graph and its Complement.*

Let R_n denote the graph with vertex set consisting of the squares of an $n \times n$ grid, with two squares of the grid adjacent when they lie in the same row or column. This is called the square rook's graph, and on it, we can play a "chip-firing" game. In this game, we start with some initial configuration of chips (an assignment of some integer to each vertex), and consider two configurations equivalent if we can get from one to the other through a series of chip-firing operations. These operations are: 1) Firing a vertex: the vertex loses its degree and any vertices adjacent to it gain a chip, and 2) Pulling a vertex: the vertex gains its degree and all vertices adjacent to it lose a chip. We can put a group structure on the set of equivalence classes of configurations, where the operation is vertex-wise addition. The group that arises is called the Critical group of R_n , and through similar means, we can find another group called the Smith group. In this talk, we discuss the group structure on R_n and its complement. (Received September 21, 2015)