1060-20-165 **Paul E. Schupp*** (schupp@math.uiuc.edu), Department of Mathematics, University of Illinois, Urbana, IL 61801. *Cellular Automata on Cayley Graphs and Amenability for Finitely Generated Groups.*

The concept of amenability for groups has been intensively studied since its introduction by von Neumann in 1929 and there is a vast literature on the subject. In the early 1950's von Neumann introduced cellular automa in the "classic case" on the grid of integer lattice points in the plane, that is, the Cayley graph of $\mathbb{Z}^2$, in order to study the question of whether or not a machine could reproduce itself.

All the relevant definitions are well-defined on the Cayley graph of any finitely generated group. A major question about celluar automata is whether or not the global transition function is surjective. Two important theorems in the classical case are the theorems of Moore and of Myhill relating "Garden of Eden" patterns and "Mutually Erasable" patterns. Dave Muller pointed out that both these theorems are false on the Cayley graph of the free group of rank 2. In a series of papers Antonio Machi and colleagues proved that both theorems hold for celluar automata on the graphs of amenable groups. Laurent Bartholdi recently proved the converse! Thus amenability is completely characteized by cellular automata properties. We will also discuss decidabilty of surjectivty on classes of groups. (Received March 29, 2010)