1096-05-1418 **Cheryl Grood**, **Johannes Harmse**, **Leslie Hogben**, **Thomas J. Hunter**, **Bonnie Jacob*** (bcjntm@rit.edu), **Andrew Klimas** and **Sharon McCathern**. *The minimum rank of the set of symmetric zero-diagonal matrices associated with a graph.*

Associated with any simple graph G is a family of symmetric zero-diagonal matrices with the same zero-nonzero pattern as the adjacency matrix of G. The minimum rank of the matrices in this family is denoted $\mathrm{mr}_0(G)$. It turns out that there is a strong connection between the ranks of these matrices and the generalized cycles that exist as subgraphs of G.

In this talk, we characterize all connected graphs G with $\mathrm{mr}_0(G) \leq 3$, as well as all connected graphs with $\mathrm{mr}_0(G) = |V(G)|$. In fact, $\mathrm{mr}_0(G) = |V(G)|$ if and only if G has a unique spanning generalized cycle, also known as a unique perfect $[1, 2]$-factor, among other names. We go on to present an algorithm for determining whether a graph has a unique spanning generalized cycle. We also determine the maximum zero-diagonal rank of a graph, also related to generalized cycles, and finally show that there exist graphs G for which some ranks between $\mathrm{mr}_0(G)$ and the maximum zero-diagonal rank of G cannot be realized. (Received September 15, 2013)