1046-05-2120 **Nathan K Pflueger*** (pflueger@stanford.edu), PO Box 12636, Stanford, CA 94309. *Binary rank and path invariance for reductions of signed graphs.*

We consider reductions of signed graphs, which are graph operations originally defined to formalize the assembly of genes in ciliates, a group of one-celled organisms. A signed graph is a graph whose vertices are each labeled either positive or negative, and a reduction is a process by which the graph is modified according to three operations, each of which reduces the number of vertices in the graph, until the empty graph is reached. We resolve several open problems regarding reductions of signed graphs by considering linear algebraic properties of the adjacency matrix of the graph over the finite field $\mathbb{F}_2$. In particular, signed graph reductions give a combinatorial interpretation to the rank of this matrix, sometimes called the binary rank of the graph, as well as to the inverse of this matrix in the case where it is invertible. Using this interpretation, we prove a conjecture of Harju et al. by demonstrating that the nullity of the adjacency matrix encodes an important invariant of the reduction process. We also prove a path invariance property of signed graph reduction, which can be used to improve the best-known computational complexity of a problem arising from reductions of signed graphs. (Received September 19, 2008)