1067-05-1272 **Mark Budden**, **Nicole Calkins** and **William Nathan Hack*** (nathan.hack@gmail.com), 102 Wyckfield Rd, Savannah, GA 31410, and **Joshua K Lambert** and **Kimberly Thompson**. *How large is your diameter? A quest for the diameter of a Rational Residue Graph.*

Paley graphs were first introduced by Sachs in the 1960's and has important connections with quadratic residues $(\mathbb{Z}/p\mathbb{Z})^{\times 2}$ where p is a prime and $p \equiv 1 \pmod 4$. A Paley graph G has p vertices and has an edge between two vertices a, b if $a - b$ is an element of $(\mathbb{Z}/p\mathbb{Z})^{\times 2}$. We can show Paley graphs have diameter 2, which follows from the relationship of quadratic residues. Taking this connection between quadratic residues and graphs we extended it to the world of rational residues for $p \equiv 1 \pmod{2^t}$. We give a sharp upper bounds for the diameter of rational residue graphs. Come and join us as we open your eyes to this new untamed frontier of combining Graph Theory and Number Theory. (Received September 20, 2010)