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**ROBERT F. BAILEY**, Grenfell Campus, Memorial University

*Cataloguing strongly regular graphs with primitive automorphism groups*

A graph is *strongly regular* with parameters  $(n, k, \lambda, \mu)$  if it has  $n$  vertices, is  $k$ -regular, and two vertices have either  $\lambda$  or  $\mu$  common neighbours depending on whether or not they are adjacent. This is equivalent to a  $k$ -regular graph having exactly three eigenvalues, namely  $k$  and two others which can be calculated explicitly from the parameters, as can their multiplicities.

Many well-known examples of strongly regular graphs arise from group actions. The GAP computer algebra system contains libraries of primitive groups (i.e. those which preserve no interesting equivalence relations) on up to 4095 points. We discuss a detailed analysis of these libraries to catalogue the strongly regular graphs (and the more general class of distance-regular graphs) which arise from these groups: while most of the graphs were already known, a few surprises which came up along the way, and some interesting questions (both theoretical and computational) remain open.

This is joint work with my NSERC USRA students Alaina Pardy and Abigail Rowsell.