1135-15-2190 **Dallas Smith*** (dallas.smith@mathematics.byu.edu), Provo, UT 84606, and **Ben Webb** (bwebb@mathematics.byu.edu), **Amanda Francis** (afrancis@carroll.edu) and **Derek Sorensen** (derek.sorensen@maths.ox.ac.uk). *Applications of Equitable Decompositions for Graphs with Symmetries.*

The symmetries of a graph are characterized by the graph's set of automorphisms. If a graph G has a symmetry, it is possible to decompose any automorphism compatible matrix M associated with G, such as its adjacency and Laplace matrices, into a number of smaller matrices $M_1, \ldots, M_n$. These smaller matrices collectively have the same eigenvalues as the original matrix M including multiplicities. This process is referred to as an equitable decomposition. Here we discuss a number of applications of this decomposition. First we demonstrate that not only can a matrix M be decomposed but that the eigenvectors of M can also be equitably decomposed. Additionally, we prove under mild conditions that if a matrix M is equitably decomposed the resulting divisor matrix, which is the divisor matrix of the associated equitable partition, will have the same spectral radius as the original matrix M. Finally, we describe how an equitable decomposition effects the Gershgorin region of a matrix M, which can be used to localize the eigenvalues of M. (Received September 25, 2017)