1172-42-56 **Judith A. Packer***, Department of Mathematics University of Color, Boulder, CO 80309-0395.

*Analyzing wavelet representations for wallpaper groups.*

We analyze the "wavelet representations" associated to fixed wallpaper symmetry groups acting on $L^2(\mathbb{R}^2)$, which generalize the conventional wavelet representations of Baumslag–Solitar groups in the two-dimensional plane. The group of integer translations is replaced by the action by a fixed wallpaper symmetry group, and the dilation matrix is chosen to be an odd integer times the identity matrix, for some odd integer greater than or equal to 3. The unitary representation is of a group generated by the wallpaper group and the dilation, which can be represented as a semidirect product $\Gamma \rtimes \mathbb{Z}$. For the analysis of the representation, we use the notion of weak cross-sections, of which the wallpaper wavelet sets for crystallographic groups constructed by K. Merrill in 2020 are the prime examples. Such cross–sections can be used to show that the related representation of $\Gamma \rtimes \mathbb{Z}$ is multiplicity free, and thus has an essentially unique direct integral decomposition into irreducible components, thus generalizing results of L.-H. Lim, J. Packer, and K. Taylor from 2001. Some areas for further study are proposed. This work is joint with L. Baggett, K. Merrill, and K. Taylor. (Received August 14, 2021)