1056-60-452 **John C Wierman*** (wierman@jhu.edu), Dept. of Applied Mathematics and Statistics, 100 Whitehead Hall, Johns Hopkins University, Baltimore, MD 21218. *Self-dual planar hypergraphs and exact bond percolation thresholds.* Preliminary report.

A generalized star-triangle transformation and a concept of triangle-duality have been introduced recently in the physics literature to predict exact percolation threshold values of several lattices. We investigate the mathematical conditions for the solution of bond percolation models, and identify an infinite class of lattice graphs for which exact bond percolation thresholds may be rigorously determined as the solution of a polynomial equation. This class is naturally described in terms of hypergraphs, leading to definitions of planar hypergraphs and self-dual planar hypergraphs. We show that there exist infinitely many self-dual planar 3-uniform hypergraphs, and, as a consequence, that there exist infinitely many real numbers $a \in [0, 1]$ for which there are infinitely many lattices that have bond percolation threshold equal to a. (Received September 18, 2009)