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Decompositions of multi-crossing link complements into bipyramids.

Knots and links are typically studied in 2-crossing projections, and given such a projection of a link L a dual pair of decompositions of the complement manifold $S^3 \setminus L$ —into octahedra at the crossings and into bipyramids in the faces—are known. Generalizing these constructions, we present a dual pair of decompositions of $S^3 \setminus L$ into bipyramids, given any multi-crossing projection of L . When L is a hyperbolic link, these decompositions give new upper bounds on $vol(S^3 \setminus L)$ given its multi-crossing projection. These bounds are in fact realized by three closely related infinite planar tiling weaves: the square weave, the triple weave, and the right triangle weave. (Received September 20, 2016)