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Boston, MA 02115. *Polyhedral Complexes for Crystallographic Groups*. Preliminary report.

Highly symmetric discrete structures in euclidean 3-space have a long and fascinating history. Various notions of polyhedral structures have attracted attention and have brought to light new exciting figures intimately related to finite or infinite groups of isometries.

A “skeletal” approach pioneered by Grunbaum in the mid 1970’s views polyhedra as finite or infinite periodic graphs equipped with additional face structure. Since then, there has been a lot of activity in this area, beginning with the full enumeration of the “new” regular polyhedra by Grunbaum and Dress around 1980, moving to the full enumeration of chiral polyhedra around 2005, and recently continuing with the enumeration of the finite regular polyhedra in 4-space by McMullen.

While these structures have the essential characteristics of polyhedra and polytopes, the more general class of discrete “polygonal complexes” is a hybrid of polytopes and incidence geometries. In very recent joint work with Daniel Pellicer, a complete classification of the regular polygonal complexes was obtained. These are periodic structures with crystallographic symmetry groups exhibiting interesting geometric, combinatorial, and algebraic properties. We give a brief overview of the classification. (Received December 20, 2011)