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*A construction of polyptych lattices via a pair of Gorenstein PL cones*

This is joint work with Christopher Manon and Laura Escobar. The theory of polyptych lattices is motivated by a desire to simultaneously generalize phenomena in toric, cluster, and tropical geometry, among others. In particular, the theory builds a combinatorics-geometry dictionary reminiscent of that in toric geometry. The theory builds the notion of mutations directly into the definitions, and gives geometric interpretations to these mutations. In particular, in some cases, a polyptych-lattice ("PL") polytope encodes a compactification  $\mathcal{X}$  of an affine variety  $U = \operatorname{Spec}(\mathcal{A})$  whose coordinate ring  $\mathcal{A}$  can be equipped with a valuation to a canonical semialgebra associated to the polyptych lattice. This is analogous to the known phenomenon that a toric variety may be viewed as a compactification of a complex torus  $(\mathbb{C}^*)^n$  by toric divisors, and the complex torus can be viewed as  $\operatorname{Spec}$  of the Laurent polynomial ring, which can in turn be equipped with the valuation that takes a Laurent polynomial to its Newton polytope. Moreover, aspects of the geometry of the compactification  $\mathcal{X}$  can be understood combinatorially; for instance, in some cases, the resulting compactifications are arithmetically Cohen-Macaulay, and have finitely generated class group and finitely generated Cox rings. The theory also naturally encodes multiple toric degenerations of the compactification  $\mathcal{X}$  to toric varieties whose moment map images are related by mutations. In this talk, I recall the setup of this theory, and sketch a new construction of polyptych lattices coming from a pair of Gorenstein PL cones.