

# The Lattice of Cyclic Flats of a Matroid

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## Abstract

Matroid theory is a combinatorial abstraction of geometry, with flats playing the role of subspaces. Cyclic flats are special flats that contain key geometric information about a matroid. This talk presents a variety of recent results and open problems about the lattice of cyclic flats. In particular, we show that every finite lattice arises as the lattice of cyclic flats of a (fundamental transversal) matroid and we show how the ideas used to prove this result give a simple proof of a new, sharper version of Dilworth's embedding theorem. We present an axiom scheme for matroid theory based on cyclic flats and their ranks, the applications of which include results on realizing matroids as intersections of other matroids. We present the only known minor-closed class of matroids that is well-quasi-ordered yet has infinitely many excluded minors. We also sketch other directions in which the theory is developing.

This talk, which is based on joint work with Anna de Mier (Universitat Politècnica de Catalunya), will include enough background on matroid theory to be reasonably widely accessible.

**Keywords:** matroid, flat, cyclic flat.