

**Partition extenders, skeleta of simplices, and Simon's
conjecture**

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If a pure simplicial complex is partitionable, then its h -vector has a combinatorial interpretation in terms of any partitioning of the complex. Such an interpretation does not exist for non-partitionable complexes. Given a non-partitionable complex, we will construct a relative complex—called a *partition extender*—that allows us to write the h -vector of a non-partitionable complex as the difference of two h -vectors of partitionable complexes in a natural way. We will show that all pure complexes have partition extenders.

A similar notion can be defined for Cohen–Macaulay and shellable complexes. We will show precisely which complexes have Cohen–Macaulay extenders, and we will discuss a connection to a conjecture of Simon on the extendable shellability of uniform matroids. This is joint work with Joseph Doolittle and Alexander Lazar.