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A non-partitionable Cohen-Macaulay simplicial complex

In 1979, Richard Stanley posed the following conjecture, which he later described as "a central combinatorial conjecture on Cohen-Macaulay complexes": Conjecture: Every Cohen-Macaulay simplicial complex is partitionable. We disprove this conjecture by constructing an explicit counterexample in three dimensions. Due to a result of Herzog, Jahan and Yassemi, our construction also disproves the conjecture, of great interest in commutative algebra, that the Stanley depth of a monomial ideal is always at least its depth.

This is joint work with Bennet Goeckner, Carly Klivans, and Jeremy Martin.