Symmetric chain decomposition for cyclic quotients of Boolean algebras and relation to cyclic crystals

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The quotient of a Boolean algebra by a cyclic group is proven to have a symmetric chain decomposition. This generalizes earlier work of Griggs, Killian and Savage on the case of prime order, giving an explicit construction for any order, prime or composite. The combinatorial map specifying how to proceed downward in a symmetric chain is shown to be a natural cyclic analogue of the $\mathfrak{sl}_2$ lowering operator in the theory of crystal bases.

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