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Kyungyong Lee, Li Li and Nicholas A. Loehr* (nloehr@vt.edu), Virginia Tech Department of Mathematics, 460 McBryde Hall, 225 Stanger Street, Blacksburg, VA 24060. *Chain decompositions for q, t -Catalan numbers.*

The q, t -Catalan numbers $C_n(q, t)$ are polynomials in q and t that reduce to the ordinary Catalan numbers when $q = t = 1$. These polynomials have important connections to representation theory, algebraic geometry, and symmetric functions. Haglund and Haiman discovered combinatorial formulas for $C_n(q, t)$ as weighted sums of Dyck paths (or equivalently, integer partitions contained in a staircase shape). This talk investigates the joint symmetry property $C_n(q, t) = C_n(t, q)$. We conjecture some structural decompositions of Dyck objects into “mutually opposite” subcollections that lead to a bijective explanation of joint symmetry in certain cases. A key new idea is the construction of infinite chains of partitions that are independent of n but induce the joint symmetry for all n simultaneously. Using these methods, we can prove combinatorially that for $0 \leq k \leq 9$ and all n , the terms in $C_n(q, t)$ of total degree $\binom{n}{2} - k$ have the required symmetry property. (Received September 20, 2016)