Classical orthogonal polynomials are known to have fruitful interpretations in terms of Lie groups and algebras. In this setting, they arise in the representation theory of these associated algebraic structures. Those algebraic interpretations of orthogonal polynomials provide simple derivations of their properties and explain their appearance in solutions to highly symmetric systems. Similar connections between orthogonal polynomials in the $q$-Askey scheme and algebraic structures beyond Lie theory have now been demonstrated. After a review of the classical results, this talk will explore the construction of such algebraic interpretations for $q$-orthogonal polynomials. In particular, an algebraic interpretation of the bivariate $q$-Krawtchouk polynomials using the $SU_q(3)$ quantum group will be presented.

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