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*Puzzles and equivariant  $K$ -theory of Grassmannians*

The cohomology of the Grassmannian has a basis given by Schubert varieties. The structure coefficients of this ring are the celebrated Littlewood-Richardson coefficients, and are calculated by any of the Littlewood-Richardson rules. This story has been extended to  $K$ -theory by A. Buch (2002) and to torus-equivariant cohomology by A. Knutson-T. Tao (2003). It is natural to unify these theories via a combinatorial rule for structure coefficients in equivariant  $K$ -theory. In 2005, A. Knutson-R. Vakil used puzzles to conjecture such a rule. Recently we proved the first combinatorial rule for these coefficients. Using our new rule, we construct a counterexample to the Knutson-Vakil conjecture and prove a mild correction to it. (Joint work with Alexander Yong)