

## **Combinatorial approaches for the subgroup restriction problem**

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In this talk I will outline the first GCT formulation, that of orbit closure, and the 'obstruction' and arrive at the subgroup restriction problem. Our specific interest is in the Kronecker product problem, i.e., of determining the structure of  $GL_{mn}$ -modules when restricted to  $GL_m \times GL_n$ . A combinatorial resolution of this, or its cousins, seems to us as one of the core difficulties. I will outline our attempt (through quantum groups) to uncover commuting crystal structures for  $GL_{mn}$  modules. There seem intriguing sub-structures with no matching quantum explanation, and some fairly subtle negative results. The work relates to and extends some of the results of Leclerc-Thibon and Danilov-Koshevoi. This is joint work with Bharat Adsul and K. V. Subrahmanyam.