# The mysterious Kronecker coefficients of the Symmetric group

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Algebraic Combinatorics is a field of mathematics which studies discrete objects often originating in Representation Theory, Algebra, Algebraic Geometry, Number Theory via combinatorial methods. One of its oldest problems concerns the Kronecker coefficients of the Symmetric Group. They are originally defined by Murnaghan more than 80 years ago as the multiplicities of the irreducible modules in the factorization of the tensor product of two other irreducible modules. They actually generalize the Littlewood-Richardson coefficients in the analogous problem for the general linear group. Despite their algebraic nature as nonnegative integers, no combinatorial formula or interpretation is known. Kronecker coefficients have recently played a role in Computational Complexity Theory both as a problem and as a solution.

In this talk I will give a brief overview the developments over the past 10 years. I will show how despite our very limited knowledge we can still use the Kronecker coefficients to solve other, seemingly unrelated problems, related to enumeration of integer partitions (Sylvester's unimodality theorem). I will also discuss some of their computational complexity aspects.

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