The Burau representation and shapes of polyhedra

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The Burau representation of braid groups has been around for almost a century. Still, we don't know the full answer to whether the Burau representation is faithful. The only remaining case is that of the 4-strand braid group, and faithfulness here has intimate connections to the question of whether the Jones polynomial detects the unknot. By in essence specializing the t parameter in this representation to certain roots of unity, an interesting connection appears with the moduli space of flat cone metrics on spheres explored by Thurston. Leveraging this connection, I will explain how one can show that the kernel of the $n = 4$ Burau representation lies in the intersection of several topologically natural, infinite index subgroups of B_4.