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# Finite Reflection Groups, Non-Crossing Partitions, and a Theorem of Deligne

## Abstract for the Combinatorics and Geometry and Topology Seminars 2008 September 9

Consider an arrangement A (a finite set) of real hyperplanes that dissect real space into regions that are simplicial cones. Let M be the complex complement of the complexification of A. In 1972 Deligne proved that M is an Eilenberg-Maclane space. The proof focuses on U, the universal covering space of M, and proceeds by first showing that simpliciality of the regions is equivalent to the existence of a certain normal form for the morphisms of the fundamental groupoid of M. This, together with the fact that U can be constructed directly from the groupoid, implies contractibility of U.

I will sketch Deligne's proof and show the connection to a similar argument of David Bessis in 2005 that proves asphericity of M for the arrangements of reflecting hyperplanes of finite unitary reflection groups. The groupoids involved in Bessis' work have structure based on the combinatorics of “non-crossing partitions”. The geometric significance of this is not yet clear.

I will give background and motivation for future talks in the combinatorics seminar about non-crossing partitions and generalizations. A better understanding of their combinatorial structure could give us insight into the topology of complex hyperplane arrangements!

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